

Mobile X-ray System
MUX-100D
INSTALLATION MANUAL

This manual is for professional service engineers.
It bears no relation to the usual operation.

Medical Systems Division
SHIMADZU CORPORATION
KYOTO JAPAN

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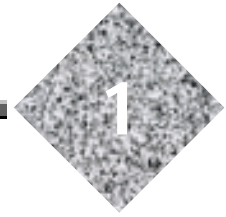
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No Text

Chapter 1



Introduction

Before installing the unit, fully grasp the contents of this Installation Manual, and install it so that the unit may deliver its full performance and functions.

Besides, thoroughly refer to the Operation Manual and Service Manual of this unit.

Refer to Canon “CXDI-50G Service Manual” for installing CXDI-50G.

Chapter Contents

1.1 Directions for using the unit

Directions about safety are described in this Section. Read this before installing the unit without fail.

1.2 Document List

1.1 Directions for using the unit

Directions about safety are described in this Section. Read this before installing the unit without fail.

The meanings of the following precaution and prohibition terms used in the operation manual are defined as below:



DANGER

States a direct danger that may cause death or serious injury if it is not avoided.



WARNING

States an indirect or potential danger that may cause death or serious injury if it is not avoided.



CAUTION

States a danger that may cause slight or medium injury or may cause damage in equipment or fire if it is not avoided.



NOTE

States the information which helps to use the system correctly.



WARNING

Never Modify the Equipment!

The Drugs, Cosmetics and Medical Instruments Act of Japan makes it compulsory that a manufacturer should apply and get approval for partial modifications of the approved contents. Have in mind that modifications without approval are prohibited.



CAUTION

Federal law restricts this device to sale by or on the order of physician.

(This caution is the prescription language required by Federal Regulations in U.S.A.)



WARNING

Consideration for X-ray irradiation

When using X-ray equipment incorrectly, operator and patient may have unnecessary irradiation. Be careful so that person other than patient does not stay in the examination room when X-rays are exposed. If it is necessary for the person other than patient to stay in the examination room, provide sufficient shield from irradiation.



WARNING

Consideration for mechanical safety

Be careful so that a part of operator's and patient's body - hand, foot etc. - may not be got jammed between moving parts of the unit or between the unit and other equipment when moving a part of the unit.



WARNING

This unit is not explosion-proof. Never use this unit at a place where flammable gas or explosive gas can be generated.



WARNING

Connect the power cord plug to a grounding 3P receptacle.



WARNING

Don't splash this equipment with water because there is a risk of electric shock. And to clean the equipment, wipe the surface of the equipment with the clothes soaked in antiseptic solution. (Medical Alcohol)



CAUTION

When operating the arm of the unit, make sure to place the unit on the floor whose inclination is 5 degrees or less. Otherwise, the unit may fall down if the arm position is not appropriate.



WARNING

Never drive the unit in a place where vibration will occur such as a road outdoor, a bumpy place or steep slope. Never stop the unit on a slope.



CAUTION

Even if the bumper switch on the front of the unit contacts an obstacle while moving, obstacles are not detected if the force applied to the bumper switch is 2 kg or smaller. Watch out for obstacles in front while moving.



CAUTION

This unit is driven by a built-in battery.

Some wires are always exposed to 240 V of power voltage from the battery even when the key switch, switch for activating the emergency brake release function, or main circuit breaker is turned off. Watch out for an electric shock during operation.

Wires that always have power voltage are red.



CAUTION

The software (Operating system, OS) installed in this device runs under Windows XP. Do not change any of the OS settings. If the OS settings are changed, device operation after those changes is not guaranteed.



CAUTION

Accidents due to operation errors or unforeseen causes can result in deleting or damage to stored hard disk data (i.e. images and data). Thus, be sure to backup (archive) important data to an external file system, or print out the file data. Additionally, since external file systems also have the danger of being damaged, be sure to perform multiple backups to prevent data deletion, damage or loss.

Also, Shimadzu Corporation assumes no liability for the loss or damage to any customer data.



CAUTION

Do not turn the main power breaker OFF during the normal operation of this device. Turning the breaker OFF can result in device damage, an operation error or data loss or damage.



CAUTION

Be sure to follow the procedures described in this manual to start or stop this product. Also, do not turn the main power breaker OFF during normal operation of this device, and especially during the operation of this device's internal magnetic disk. Turning the breaker OFF can result in device damage, an operation error or data loss or damage.



CAUTION

Do not connect peripheral units that are not compliant with safety regulations (comform to IEC60601-1) to this device's connectors (LAN port, USB port, etc.). Connecting one of these units can result in device damage, operation error, smoking, overheating, electric shock, data loss or damage.



CAUTION

Shimadzu Corporation assumes no liability in the event of data deletion or damage, device accident or damage, or loss occurs due to the installation of software or the connection of a peripheral unit that is not designated by Shimadzu Corporation.



CAUTION

Shimadzu Corporation assumes no liability in the event of data deletion or damage, device accident or damage, or loss occurs due to the modification or deletion of this software's setting files (Autoexec.bat, config.sys, etc.) and DR system software files.



CAUTION

Shimadzu Corporation assumes no liability in the event of device data deletion, damage or loss, due to an operation error or sudden accident.

Software License Agreement

The software used in this product is copyrighted by Shimadzu Corporation, who possesses all rights, including sublicenses for those rights received (for copyrights, etc.) held by third parties.

The Customer and Shimadzu have the following agreement concerning the usage of this software.

1. Application

- i. This software (hereafter "the software") includes all software programs, additional data and the Installation Guide used by this device.

2. Rights

- i. The Customer is allowed to use the software with a single (1) device.
- ii. If the customer wishes to transfer all of their rights to the software, the creation of a copy of the software is prohibited and the software in its entirety (the program, and all its media and user documentation, including this Installation Guide) must be transferred. The assignor is then assumed to be legally bound by the terms and conditions of this agreement.
- iii. The Customer shall not, in all or in part, loan, lease, sub-license, reproduce, modify, edit, reverse-engineer, reverse-compile, or reverse-assemble the software. These actions also are not allowed by third parties.

3. Copyright

- i. Shimadzu Corporation retains all the software's ownership, copyright, and software-related intellectual property rights.

1.2 Document List

If necessary, the following documents can be obtained. Contact the responsible service shop of Shimadzu Corporation.

Document	Document Number
MUX-100D Operation Manual	M503-E017
MUX-100D Installation Manual	M503-E320
X-ray tube assembly Operation Manual	M535-E219
MUX-100D Parts List	M503-4007
MUX-100D Connection Diagram	There is no document number.

No Text

Chapter 2

2

Outline

This chapter describes the outline and features of "Mobile DaRt".

Read this before installing the unit.

Chapter Contents

- **2.1 Name of Each Part of the Unit**
The name of each part of the unit is described in this Section.
- **2.2 Name of Each Circuit Board and Layout of the Circuit Boards**
The name of each circuit board and layout of the main circuit boards installed in the unit are described in this Section.
- **2.3 Conditions for Installation (using)**
Basic specifications are described.
- **2.4 Conditions for Transportation and Storage**
Basic specifications are described.

2.1 Name of Each Part of the Unit

Appearance

X-ray tube unit:

The combination of X-ray tube and collimator can turn around the axis of X-ray focus. This makes positioning and adjustment of the irradiation field and small movement of the unit.

Support Stand:

Holds the tube section and arm. It can turn itself.

Arm section:

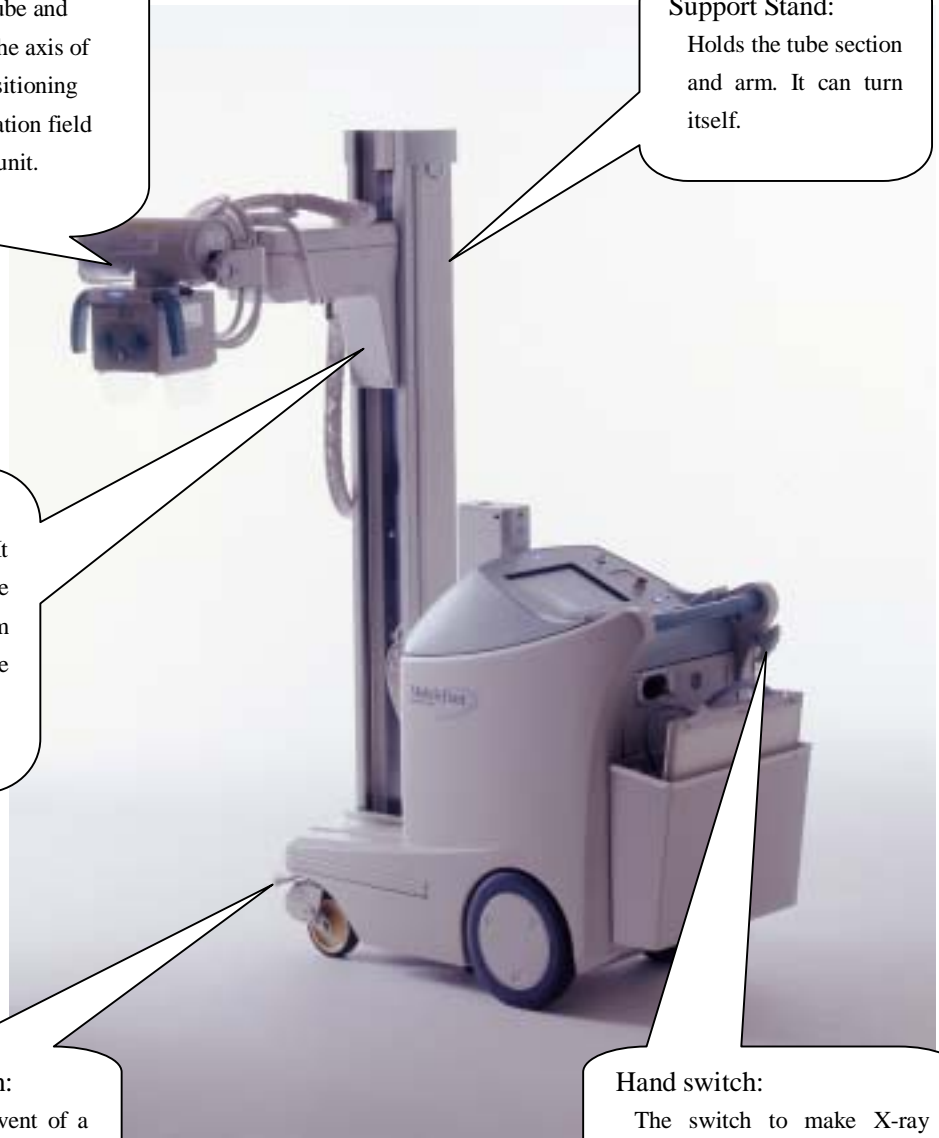
Holds the tube section. It can slide vertically on the support stand and the arm itself can stretch in the horizontal direction.

Bumper switch section:

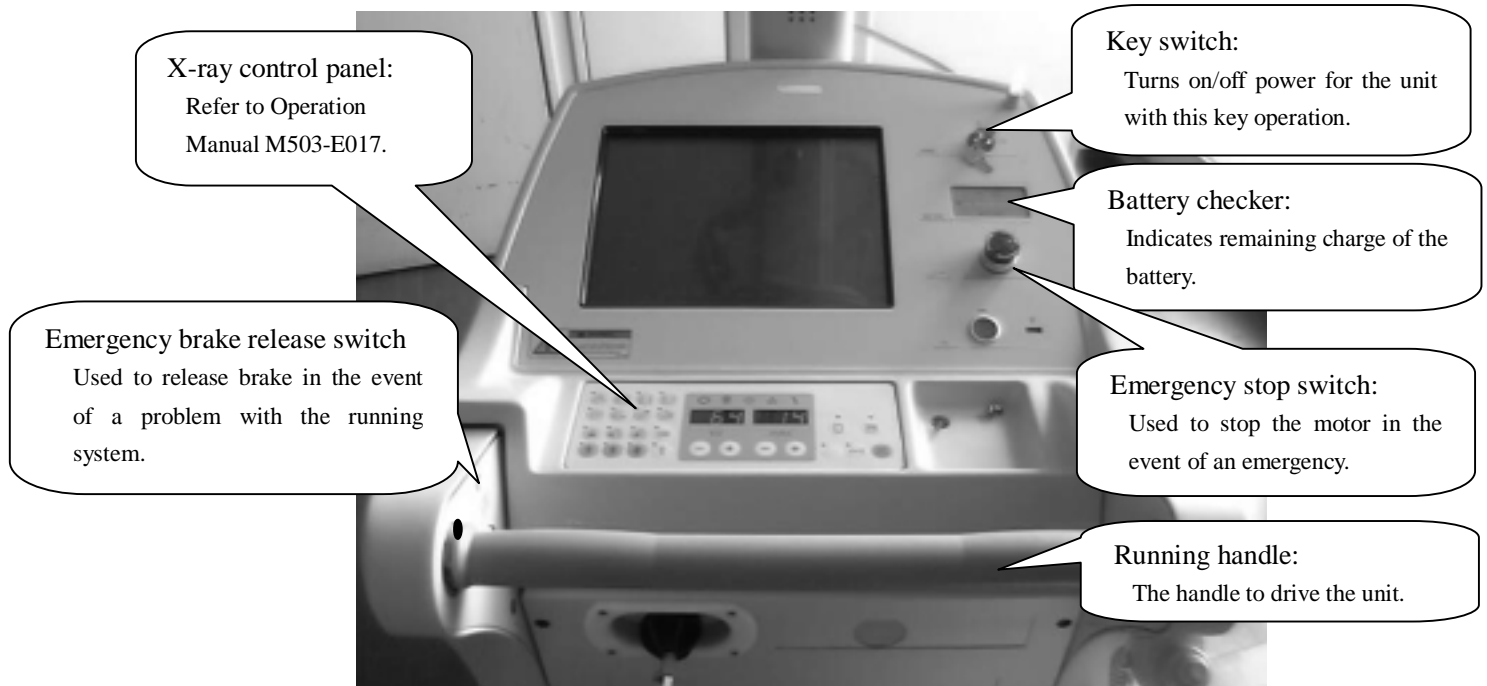
Stops the unit in the event of a collision.

Hand switch:

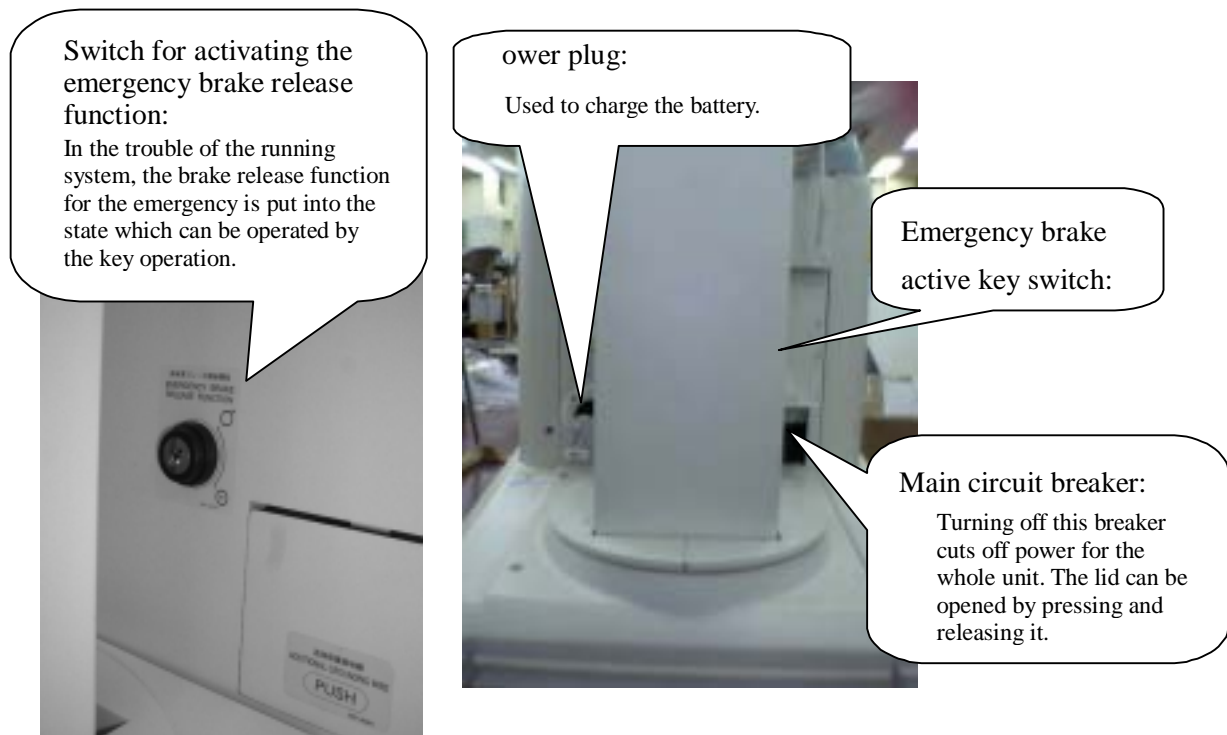
The switch to make X-ray exposures



Operating section

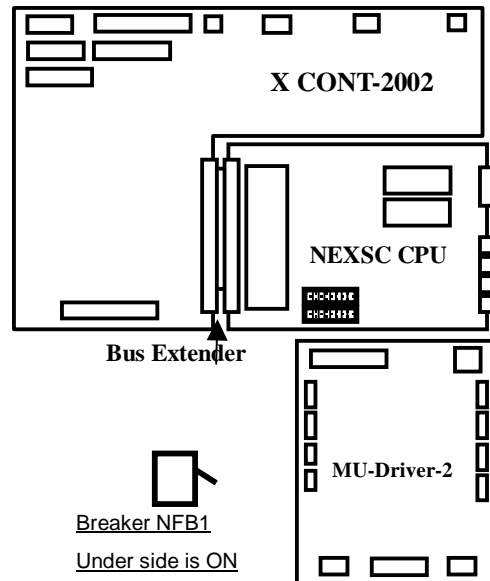
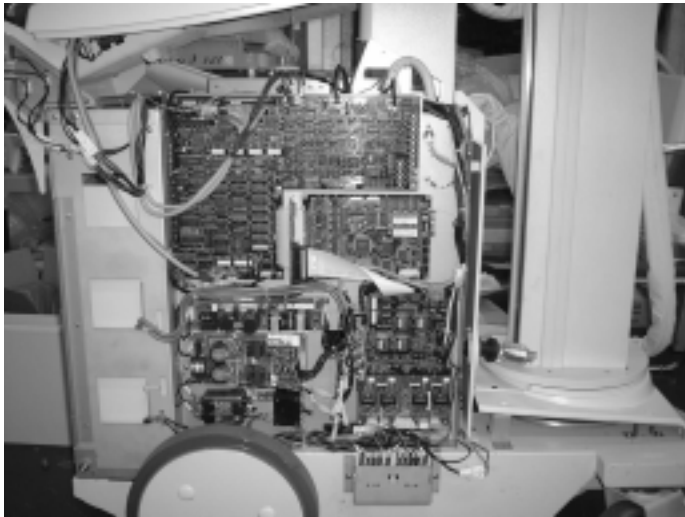


Power plug and main circuit breaker

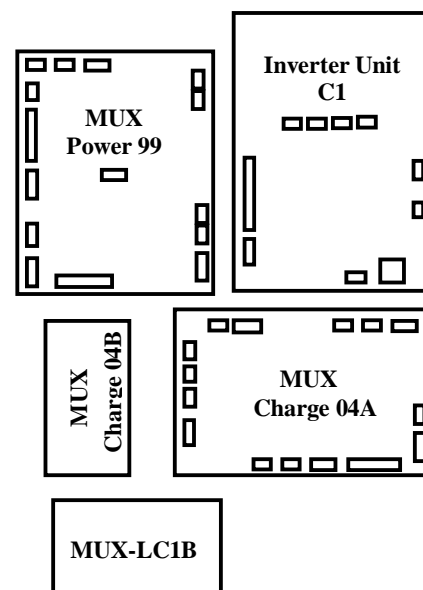


2.2 Name of Each Circuit Board and Layout of the Circuit Boards

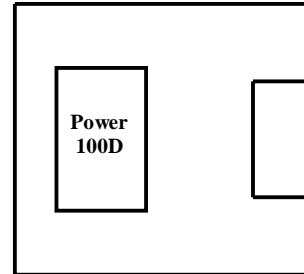
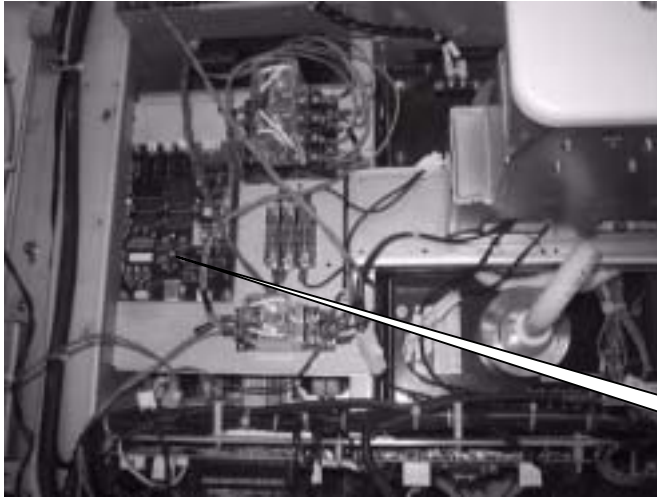
Right side of the unit



Left side of the unit



Top of the unit (battery)



Power 100D

2.3 Conditions for Installation (using)

Use environment

Ambient temperature	: -10 - 40
Relative humidity	: 30% - 60% (no dew condensation)
Atmospheric pressure	: 700 hPa - 1060 hPa



As for charge the battery, do it in the use environment.
Do not do it in the storage environment.

Storage environment (without a package for transport and storage)

Ambient temperature	: -10 ~ 40
Relative humidity	: 30% ~ 60% (no dew condensation)
Atmospheric pressure	: 700 hPa ~ 1060 hPa

Power supply

AC power	
System	: Single phase AC
Frequency	: 50/60 Hz
Standard voltages	: 100, 110, 120, 200, 220, 230, 240 V
Voltage variation range	: $\pm 10\%$ of standard voltages
Supply capacity	: 1kVA
Supply Impedance	: 100, 110, 120 V : 1.0 or less 200, 220, 230, 240 V : 4.0 or less

Earth

Earth terminal	: Earth resistance of 100 or less
Additional earth terminal	: Earth resistance of 100 or less

2.4 Conditions for Transportation and Storage



NOTE

This condition is applied only at the time packed for transportation or storage.

Transportation and Storage environment

Ambient temperature: -10 ~40

(The upper bound of the temperature is allowed up to +50 only for the period of less than one month.)

Relative humidity: 10%~60%

Atmospheric pressure: 700hPa~1060hPa



NOTE

When the unit is kept in storage for a long time until its installation, it is recommended to charge the battery within the following period in order to keep the performance of the battery:

Storage temperature	40	: Once every 2 months
	30	: Once every 4 months
	25	: Once every 6 months



CAUTION

DO NOT CHARGE THE BATTERY WHEN PACKED.

Place the unit in a well-ventilated area to charge the battery.

No Text

Chapter 3

3

Preparations for installation

Before installing the unit, thoroughly read this Chapter and make necessary preparations.

Chapter Contents

3.1 Tools Required for Installation

Tools Required for Installation. The list of tools required for installation is described in this Section.

3.2 Unpacking

The works to be carried out from unpacking to moving the unit are described in this Section.

3.3 How to Open/Close the Covers

How to open/close each cover is described in this Section.

3.1 Tools Required for Installation

When installing the unit, prepare the following tools:

Screw drivers and Philips screw drivers

Hexagonal bar L-type spanners: No. 2.5 ~ 10

Nipper

Plier

Multimeter

Insulation lock

Grease

Cutter

Waste cloth

Alligator clip

Alcohol for cleaning

Oscilloscope

Hexagonal bolt M8 x 16: (Only for exchanging X-ray tube)

Plier for FU Lock nut AW04: (Only for exchanging X-ray tube)

Spring gauge: (Only for adjusting X-ray tube or adjustment of handle)

USB port hub: 2 ports or more. Necessary to set up CXDI-50G.

Keyboard (USB)

Mouse (USB)

FDD (USB)

3.2 Unpacking



CAUTION

Check the shock detectors on the imaging unit.

Make sure there is no damage on the package before opening CXDI-50G. Do not drop or shock the package.

The imaging unit is equipped with four shock detectors. This detector is normally white, and an excessive shock will cause it to change color. If the shock detector changes color, there is a chance the imaging unit is damaged or broken.

Make sure the following items are packed together:

Make sure the following items are packed together.				Part number	Quantity	Description
MUX main unit	MUX-100D		503-61000-01	1		
	MUX-100DJ		503-61000-04			
	Components	Arm cover	503-47619	1	Screws are attached on the tap hole on the arm and arm cover.	
			503-47620	1		
		Spare parts	502-21566	1	Including 46 pieces of screw caps (5 pieces are the reserves.)	
		Operation manual	M503-1028	1		
		Installation manual	M503-2008	1		
CXDI-50G	Imaging unit			1	Make sure that the color of shock detectors has not changed.	
	X-Ray I/F Cable			1		
	Power Cable			1		
	Power Box			1		
	Sensor information file FD			1		
	Remote switch			1	Not used.	
	CXDI application software			1		
	Manual			1 set		

For CXDI-50G, refer to Canon manual.

Options	Remote controller	502-21343-06
	Protection screen	503-50338-01
	Dose area meter	503-63066 503-63066-01 (UL)
	CXDI-50G grid unit (r10, N40, f ₀ 180)	
	CXDI-50G grid unit (r8, N40, f ₀ 110)	
	CXDI-50G grid unit (r6, N40, f ₀ 150)	
	CXDI-50G grid unit (r4, N40, f ₀ 110)	

After unpacking, turn on the main circuit breaker and key switch (refer to Fig. 3-1 and Fig. 3-2.), and move the unit to where X-ray radiation is allowed and power outlet is provided. The main circuit breaker is provided at the front side of the unit (refer to Chapter 2).

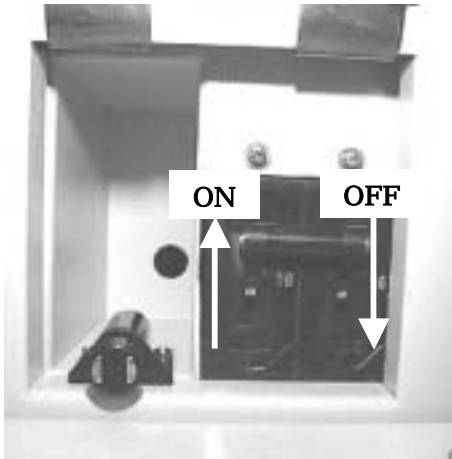


Fig. 3-1 Main circuit breaker



Fig. 3-2 Key switch

3.3 How to Open/Close the Covers



Be sure to open/close covers after turning off the main breaker. Otherwise, there is a danger of receiving electric shock.

Name of Each Cover and Layout of the Covers

There is a sequence of opening/closing the covers as shown in Fig. 3-3. For example, to remove the top cover, the side cover must be removed first.

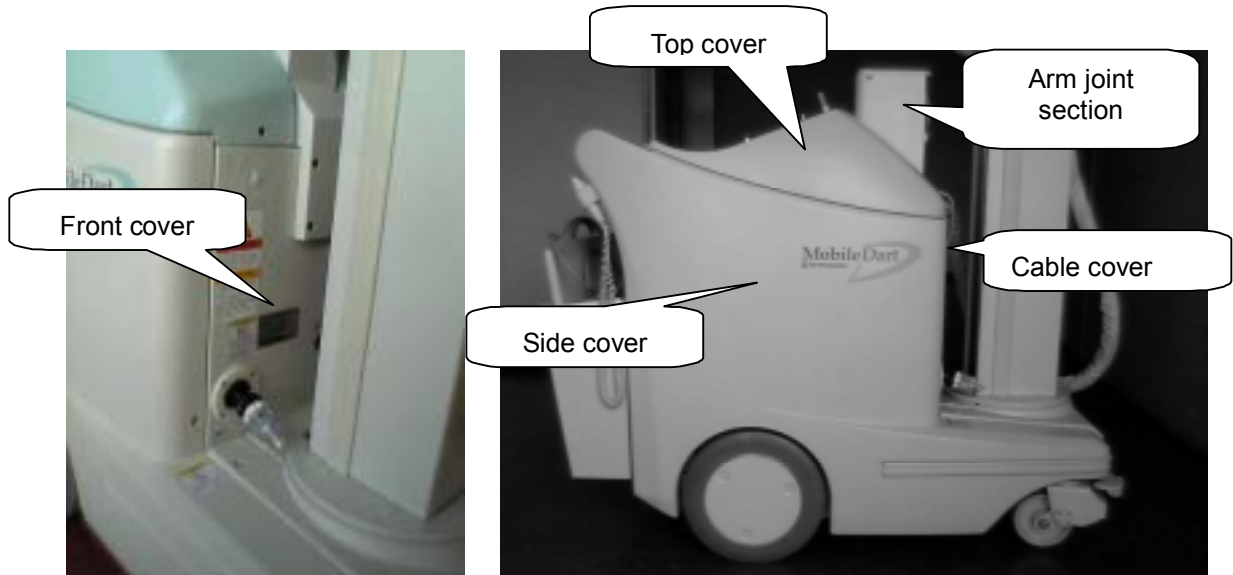


Fig. 3-3 Name of each cover and layout of the covers

How to Open/Close the Side Cover



Treat the imaging unit carefully!

Do not drop or hit anything with the imaging unit, or it might be damaged and does not work anymore.

The imaging unit is equipped with four shock detectors. This detector is normally white, and an excessive shock will cause it to change color. If the shock detector changes color, there is a chance the imaging unit is damaged or broken. Also, if the shock detector changes color, any damage incurred is outside the scope of the device's guarantee.



Do not overload the imaging unit with heavy objects!

This can damage or break the imaging unit's sensor.

Load limits:

Uniform Load: 150kg/Entire imaging surface load: 100kg/Φ40mm
Section Load: 100kg/Φ40mm

1. Take out the imaging unit from the storage bin and place it on a stable location.
(Prevent the imaging unit from falling down.)
2. Loosen the two bolts on the bottom of the storage bin shown in Fig. 3-4 and remove the four bolts in front.
(The storage bin falls down when the bolts are removed. Remove the bolts while holding the storage bin.)

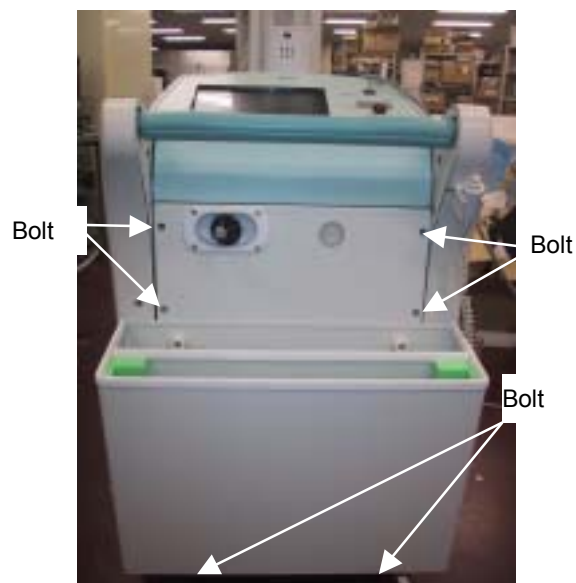


Fig. 3-4 Points fastened on the storage bin

3. Slightly tilt the storage bin forward and lift it up to detach.
4. Store the imaging unit in the storage bin as shown in Fig. 3-5 and proceed to procedures 5 and after.

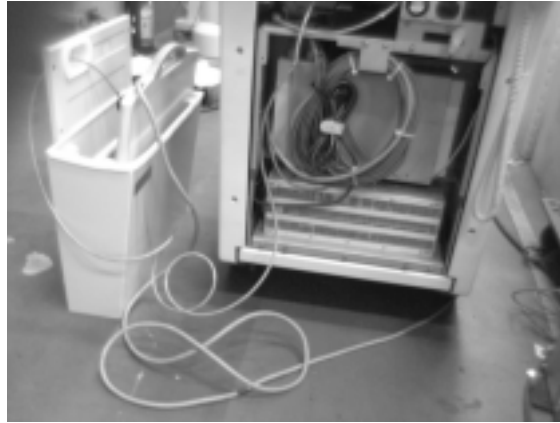


Fig. 3-5 Handling the imaging unit while operation



Do not pull the cable.

Do not pull the imaging unit when the cable is caught.

Doing the above may break the cable, causing a fire or electric shock which may damage or break the unit.

5. Remove the seven screws shown with arrows in.

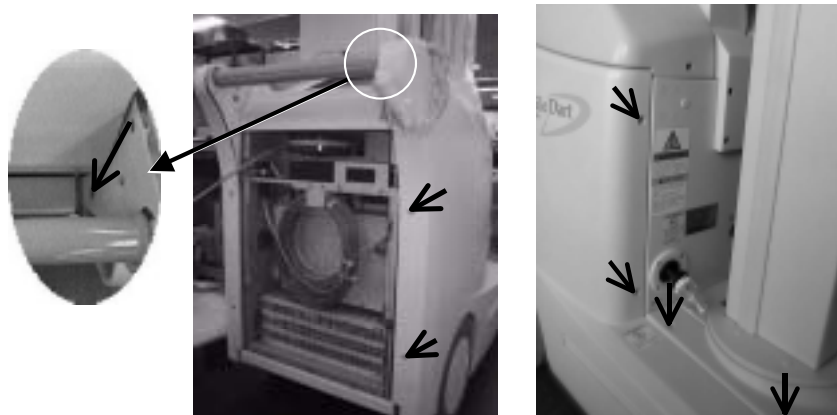


Fig. 3-6 Points to screw on the side cover

6. Pull the side cover sideways to detach.



The right side cover and the main unit are connected with the cable of the hand switch. Be careful to remove the right side cover.

How to Open/Close the Top cover

1. Turn the X-ray tube 180 degree around the X-ray tube stand. And move the X-ray tube to the lowest position.

Turn off the key switch and the main breaker.

2. Unscrews the three screws as shown in Fig. 3-7.
3. Unscrews the three screws on the Top cover
4. Pull up the front part of the top cover (Fig. 3-8).



The top cover and the main unit is connected with the cables. Be careful to remove the top cover.



(a)



(b)

Fig. 3-7 Screw cramp positions of the top cover.



Fig. 3-8 Screw cramp positions of the top cover.

How to Open/Close the Front Side Cover

1. Unscrew the 5 screws as shown in Fig. 3-9 and remove the top cover to the side of the unit.
2. Slightly holding up the column under-cover, pull out forward and remove the cover.



Fig. 3-9 Method of opening/closing the front cover

How to Open/Close the Front Rear Cover

1. Unscrew the two screws as shown in Fig. 3-10 (a).
2. Unscrew the four screws in the column under-cover as shown in Fig. 3-10 (b).
3. Remove the front rear-cover, slightly holding up the column under-cover, as shown in Fig. 3-10 (c).

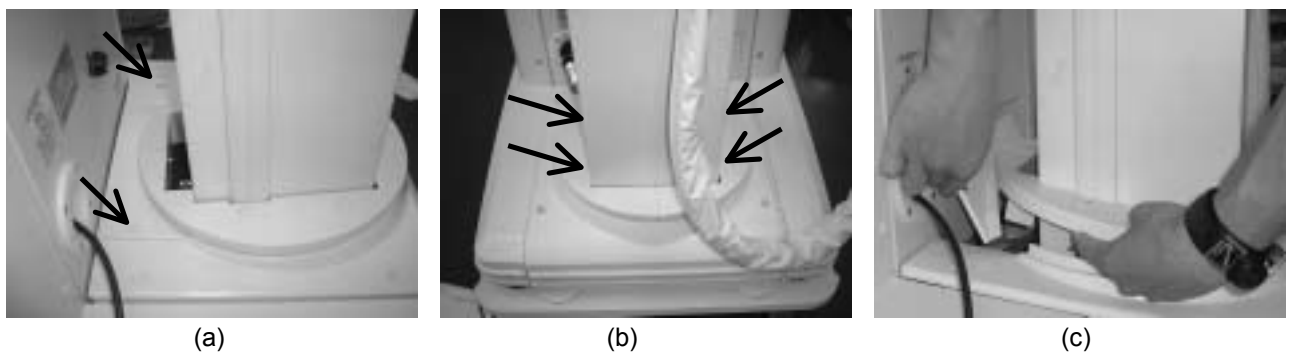


Fig. 3-10 Method of opening/closing the front rear-cover

How to Open/Close the Cable Cover

1. Unscrew the two hexagon socket head cap screws as shown in Fig. 3-11.
2. Pull the cable cover upward and remove it.

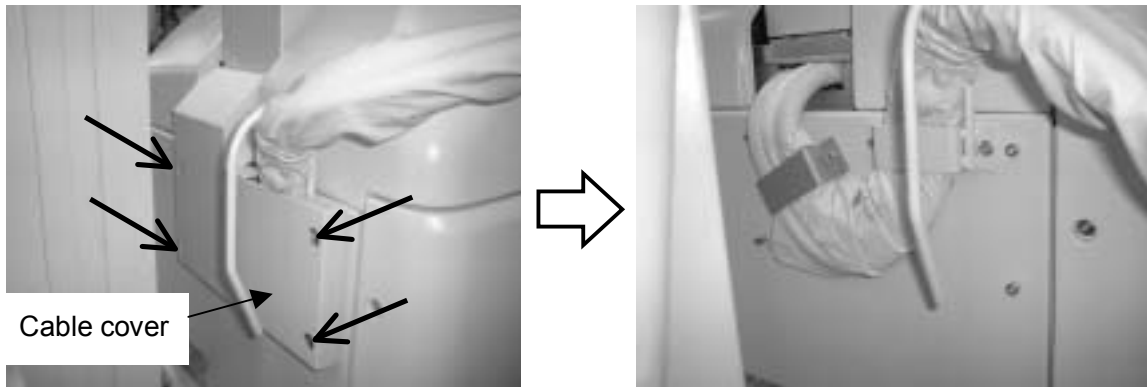


Fig. 3-11 Screw cramp positions of the cable cover

How to Open/Close the Front Cover

1. Remove the front side cover and front rear cover.
2. Remove the cable cover.
3. Remove the cable guide and cable holder.
4. Remove the code guide.
5. Unscrew the four screws as shown in Fig. 3-12 and remove the front cover.

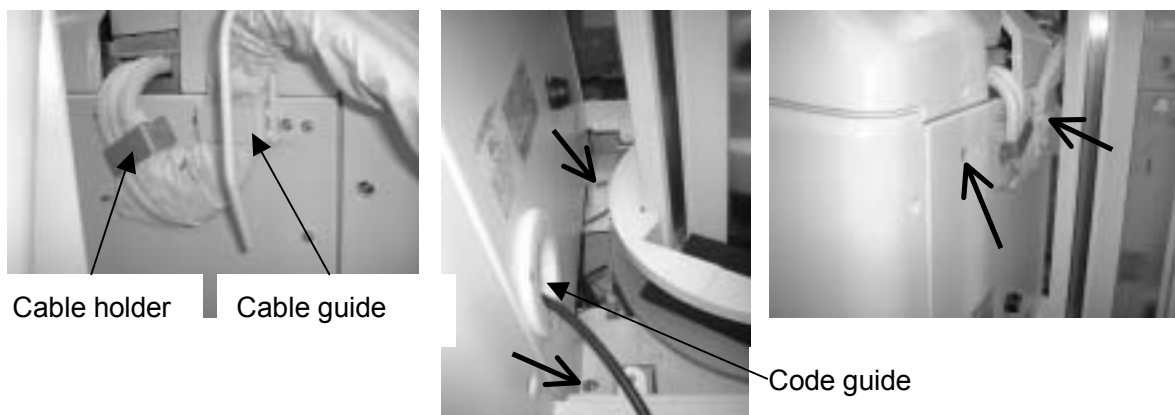


Fig. 3-12 Screw cramp positions of the front cover

6. Remove the line switch for activating the emergency brake release function. Remove frame front cover. The switch separates by blowing down the lever.

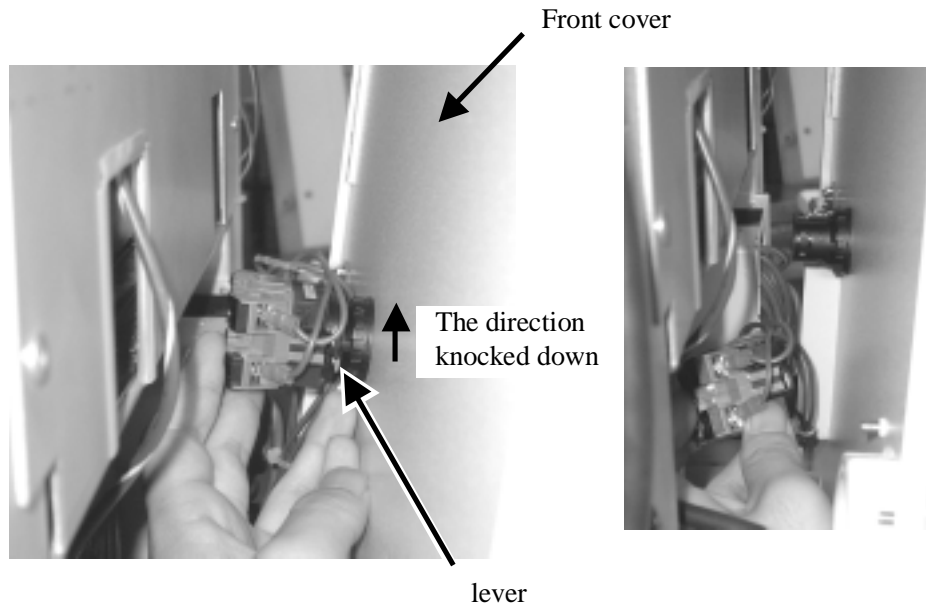


Fig. 3-13 How to remove the switch for activating the emergency brake release function.

How to Open/Close the Arm Joint Section

1. Remove the side covers, the upper cover and the cable cover.
2. Unscrew the hexagon socket head cap screws at the two locations indicated in Fig. 3-15.
3. Remove the knob of the arm lock release lever by turning it counterclockwise.
4. Pull out the top plate and the main cover of the arm joint section.

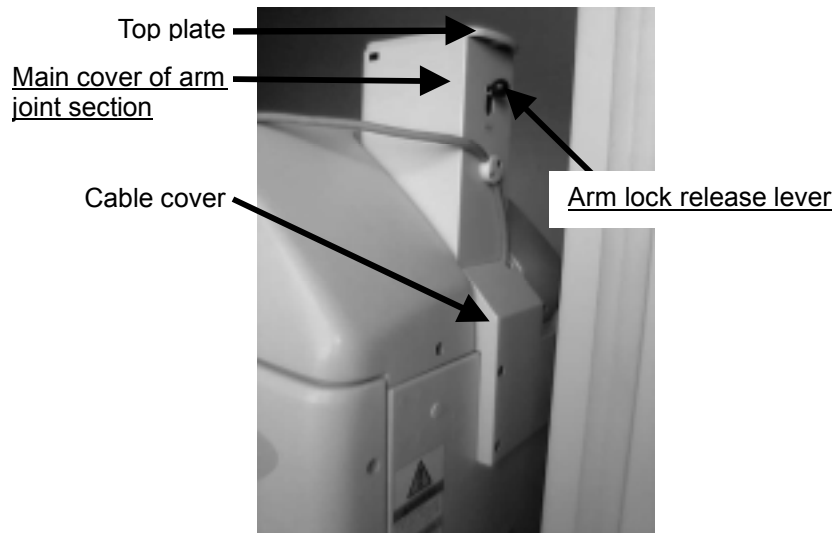


Fig. 3-14 Name of each part of the arm joint section



Fig. 3-15 Screw cramp positions of each cover

Chapter 4

4

Installation

Install the unit properly in the procedures described in this Chapter.

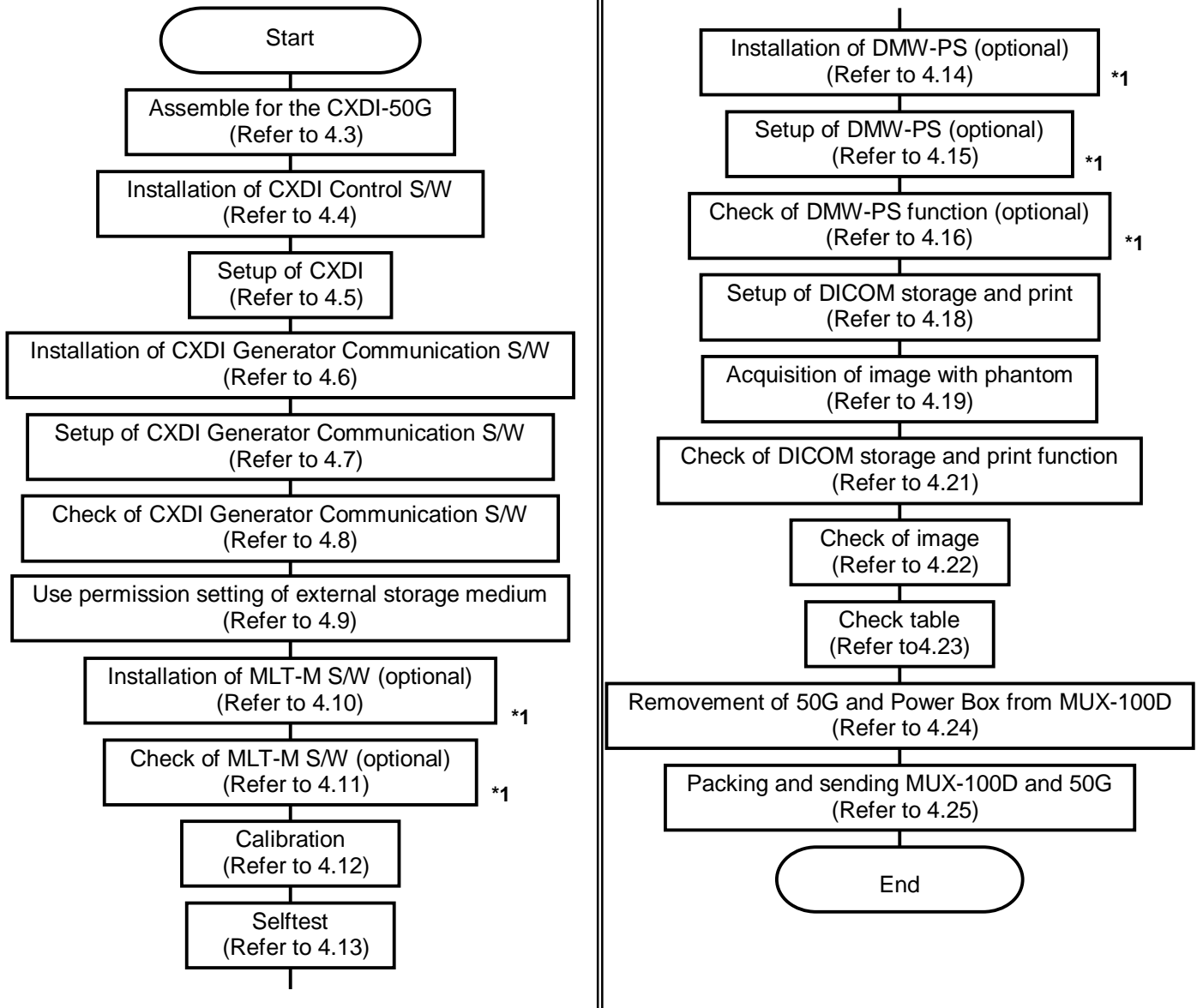
Chapter Contents

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- 4.2 Installation Procedures
- 4.3 Assemble for the CXDI-50G
- 4.4 Installation of CXDI Control S/W
- 4.5 Setup of CXDI
- 4.6 Installation of CXDI Generator Communication S/W
- 4.7 Setup of CXDI Generator Communication S/W
- 4.8 Check of CXDI Generator Communication S/W
- 4.9 Use permission setting of external storage medium
- 4.10 Installation of MLT-M S/W (optional)
- 4.11 Check of MLT-M S/W (optional)
- 4.12 Calibration
- 4.13 Selftest
- 4.14 Installation of DMW-PS (optional)
- 4.15 Setup of DMW-PS (optional)
- 4.16 Check of DMW-PS function (optional)
- 4.17 Setup of annotation
- 4.18 Setup of DICOM storage and print
- 4.19 Acquisition of image with phantom
- 4.20 Check of REX value

- 4.21 Check of DICOM storage and print function
- 4.22 Check of image
- 4.23 Check table
- 4.24 Removal of 50G and Power Box from MUX-100D
- 4.25 Packing and sending MUX-100D and 50G
- 4.26 Adjustment of Image quality
- 4.27 Installing the arm cover
- 4.28 Attaching of a knob for locking collimator rotation
- 4.29 Changing According to the Power Supply
- 4.30 Setting of XCONT
- 4.31 Checking Performance of Each Part
- 4.32 Initial setting
- 4.33 Attaching screw caps
- 4.34 Charging the Battery after installation
- 4.35 Installing an apron hanger
- 4.36 Assembler Test

4.1 Preinstallation Procedures

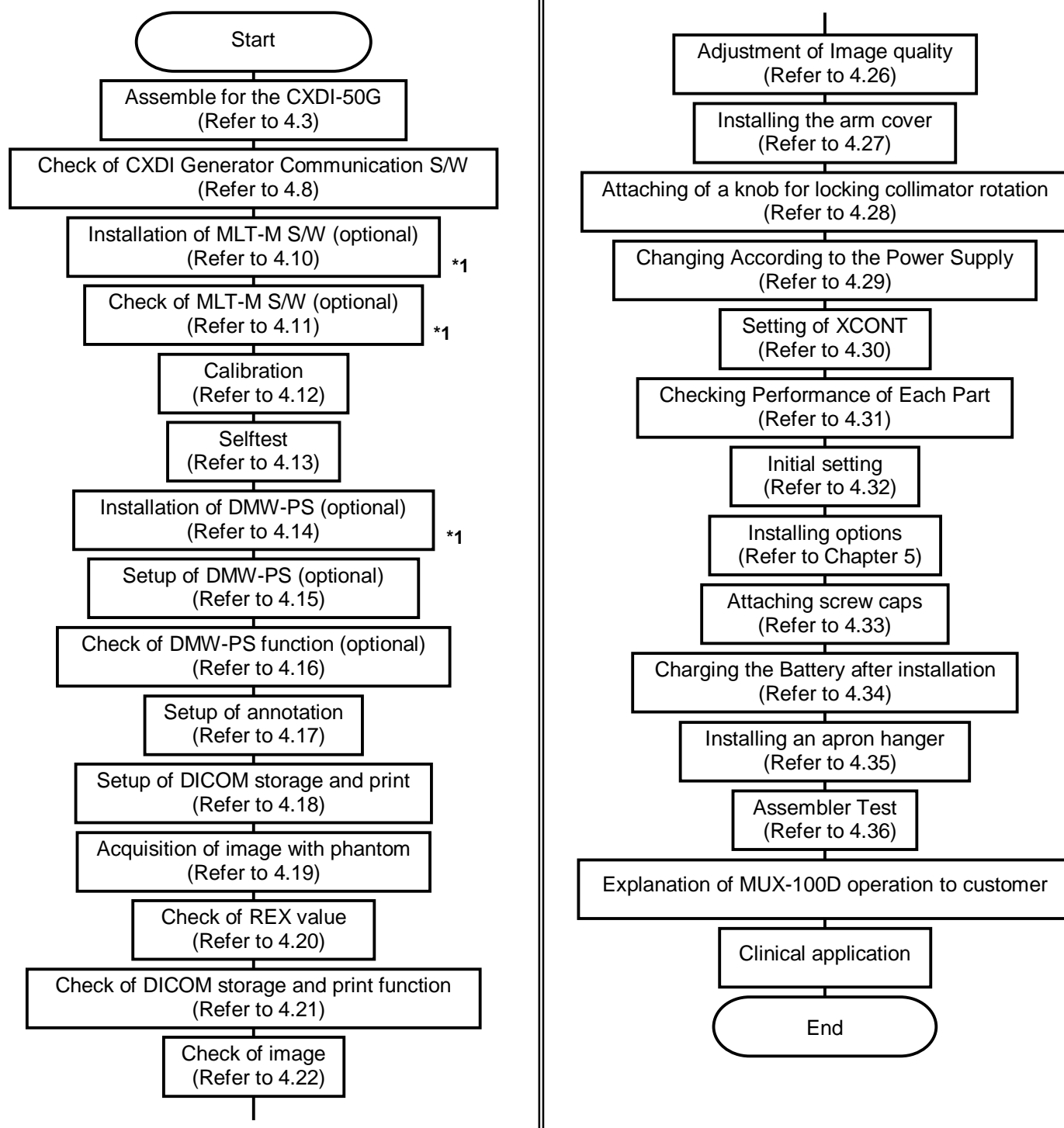
Preinstallation the unit according to the flowchart below in the warehouse etc.



*1 : This work is not need if it will be done in installation.

4.2 Installation Procedures

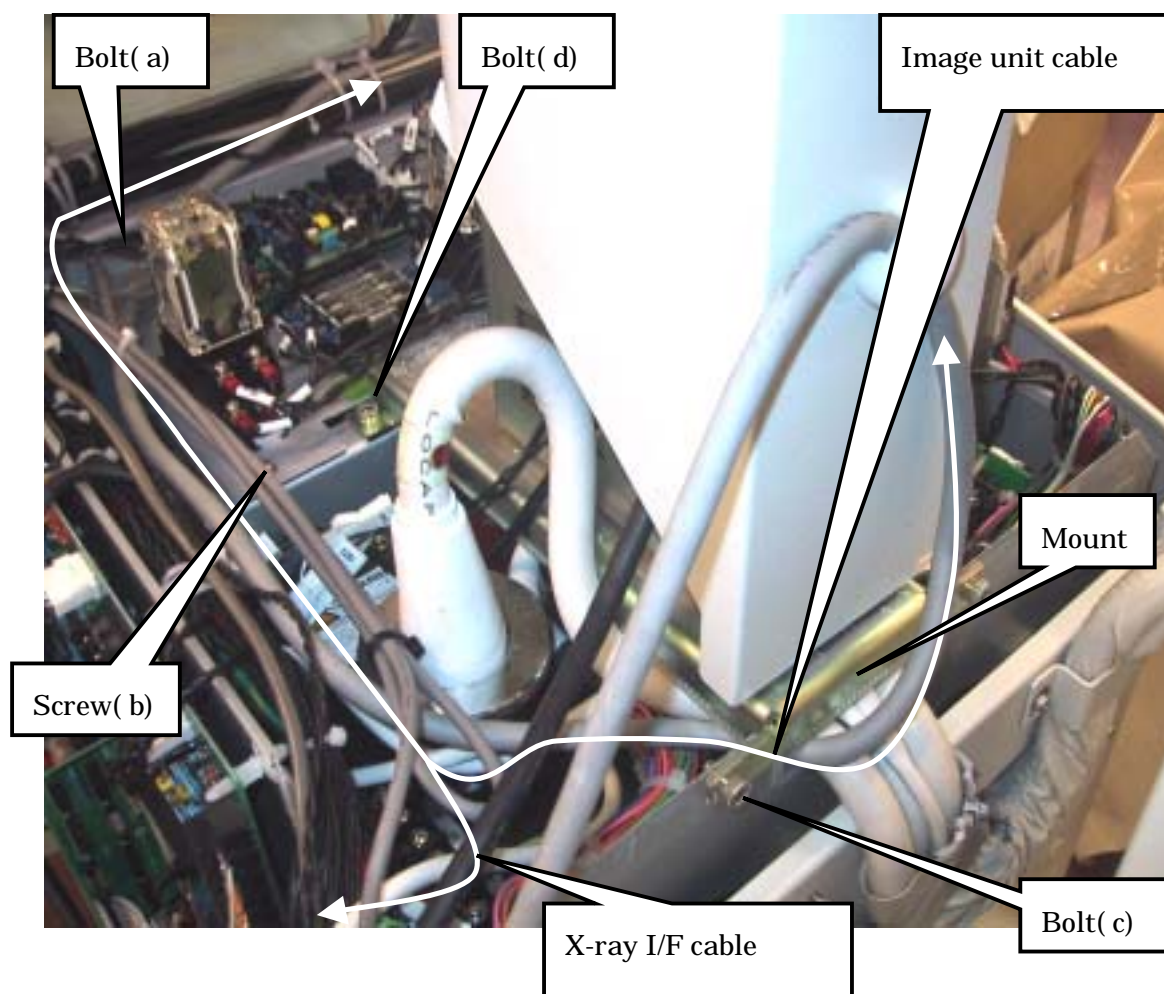
Install the unit according to the flowchart below.



*1 : This work is not needed if it was finished in preinstallation.

4.3 Assemble for the CXDI-50G

1. Turn off the main circuit breaker.
2. Open both side cover, top cover, cable cover and FPD box.
3. Wiring of the CXDI-50G
 - Loosen the bolts (a) and remove the screws (b).
 - Loosen the bolts (d) and remove the bolts (c).
The bolts (b) are
 - Pass the sensor cable between the frame and the mount.
 - Fix the sensor cable so that the length between the cover and the FPD is 4.5m or less. (Refer to Fig. 4-1)
 - Fix the sensor cable as Fig. 4-1.
 - Connect the cables according to CANON Inc. CXDI manual.



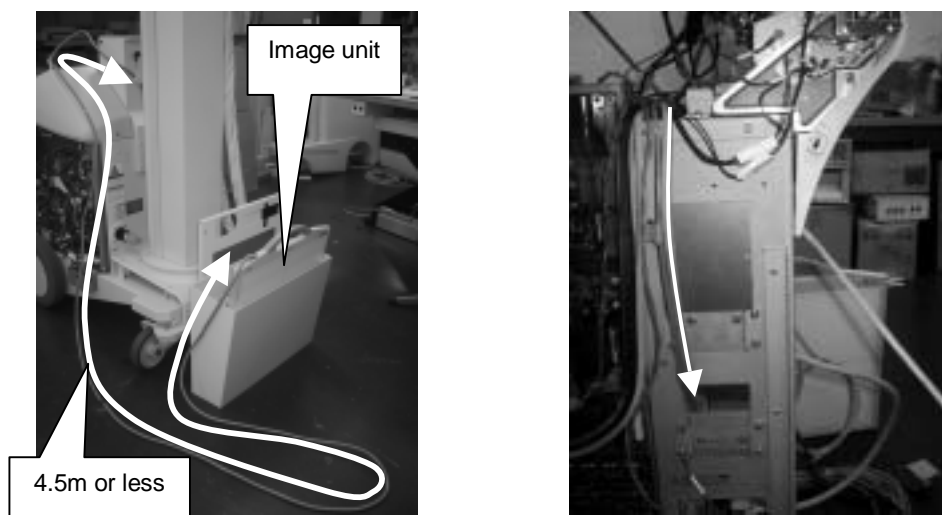


Fig. 4-1 Cable processing

- Detach the cover of the Power Box and connect the cable of the Power Box and imaging unit. (Fig. 4-2 shows how cable is fixed after the connection.)



Fig. 4-2 Cable connection between the Power Box and imaging unit

4. Connect the X-ray I/F cable attached to CXDI-50G.
 - Connect the X-ray I/F cable to the Power Box and terminals of XCONT board. (Fig. 4-3 (a) (b))
- Fix the X-ray I/F cable just like fixing the CXDI-50G cable described in 3. (Refer to Fig. 4-1)

Matching of wire marks on cables and terminals is as shown below.

Table 4-1 Matching of wire marks on cables and terminals

Cable wire mark	XCONT terminal
A1	1B2
A2	1B22
B1	1B1
B2	1B11

- For connection procedures, refer to CANON Inc. CXDI manual.

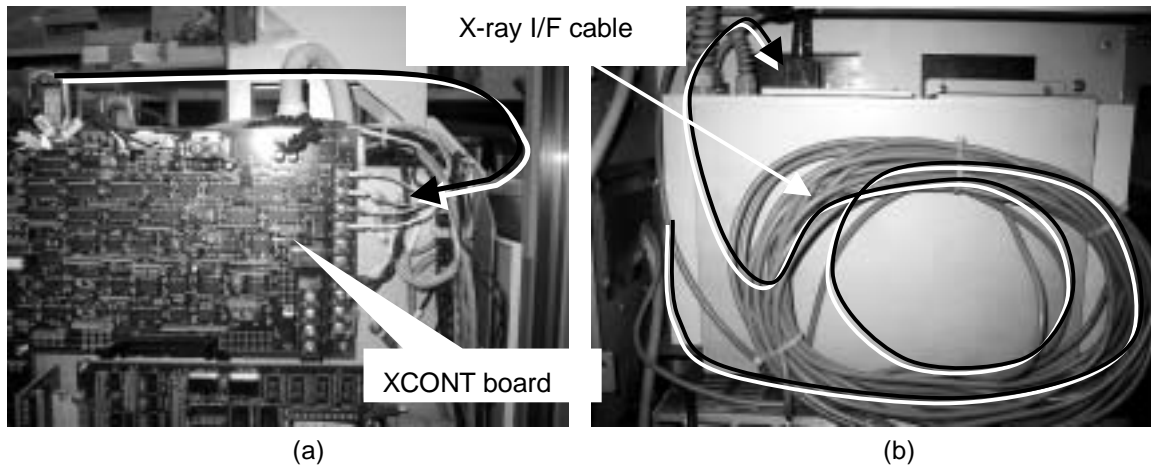


Fig. 4-3 X-ray I/F cable wiring

- Roll the excessive cable. (Fig. 4-3 (b))
- Attach the cover of the Power Box.

5. Fix the Power Box.

- Detach four PADs on the Power Box.
- Detach the plate that holds the Power Box.
- Place the Power Box on the base plate and fix it with the retainer plate.

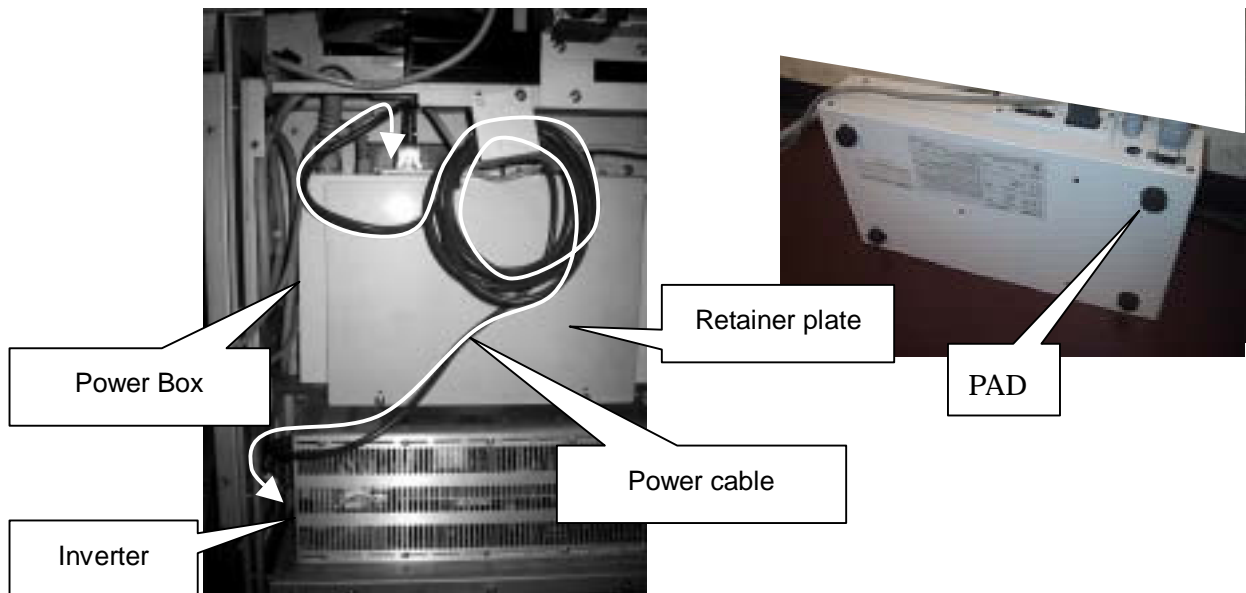


Fig. 4-4 Fixing the Power Box and wiring

6. Connect the power cable attached to CXDI-50G.
 - Connect the power cable to the inverter and Power Box. (Refer to Fig. 4-4.) Roll the excessive cable.
7. Connect the PC and Power Box with the LAN cable.
8. Fix the rolled cable using a cord bracket.

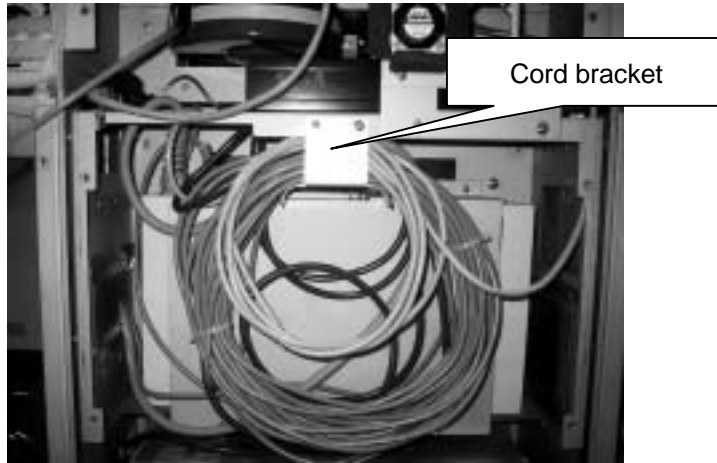


Fig. 4-5 Fixing the excessive cable

9. The remote switch attached to CXDI-50G is not used. Turn on the main circuit breaker.

4.4 Installation of CXDI Control S/W

Install CXDI Control S/W “CXDI-RD” according to the following procedures.

1. Create 《CCR》 folder (D:\CCR) at PC's D: drive.
2. CD is insert the DVD-ROM drive, and the window is opened.
3. Select and open the <Setup> file at CD's folder.



Fig. 4-6

4. "Installation wizard" is displayed. 【Next >】 is pressed.

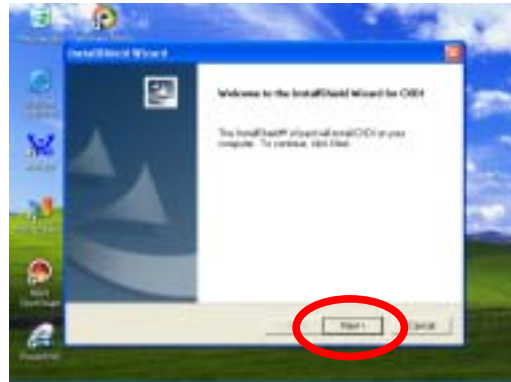


Fig. 4-7

5. After it agrees to the use permission contract, 【Yes】 is pressed.

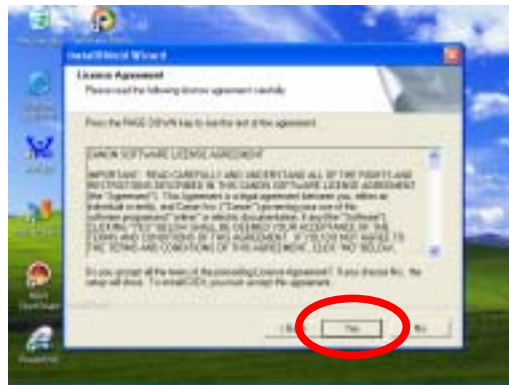


Fig. 4-8

6. Check the folder at the installation destination 《D:\CCR\》, 【Next >】 is pressed.

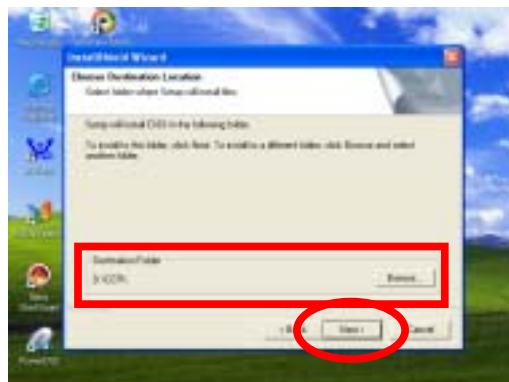


Fig. 4-9

7. "Begin the file copy" is displayed. 【Next >】 is pressed.

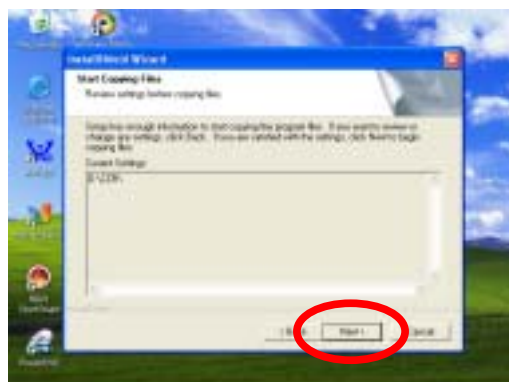


Fig. 4-10

8. "Setup status" screen is displayed. Wait for setup complete.

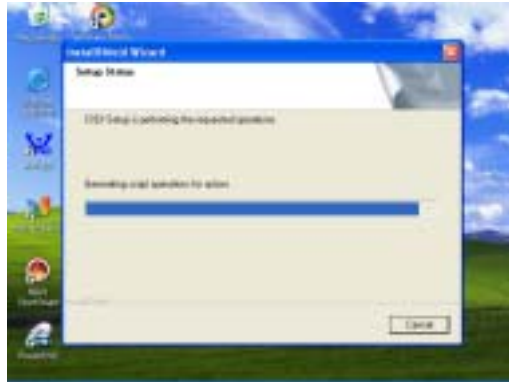


Fig. 4-11

9. Check the setup installation completed, 【Finish】 is pressed.

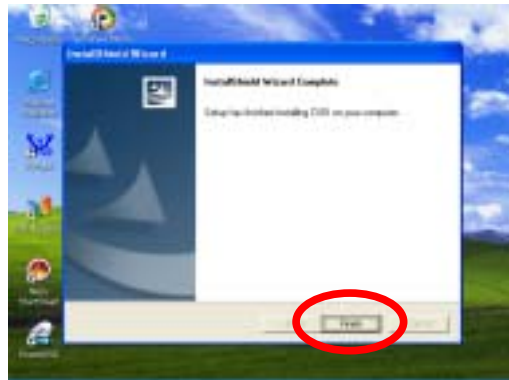


Fig. 4-12

The installation of CXDI-RD is completed.

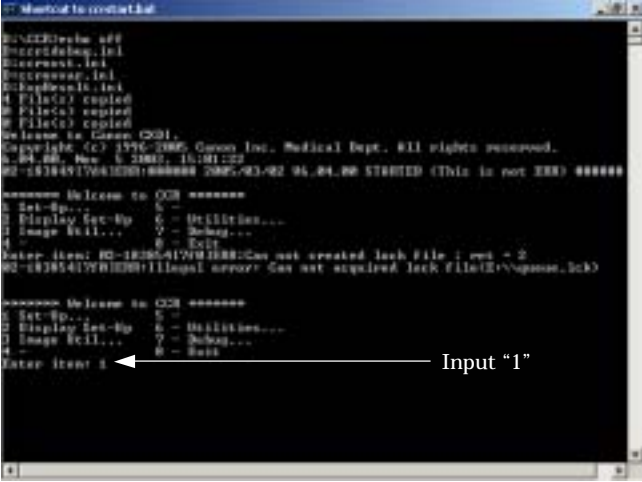
4.5 Setup of CXDI

4.5.1 Input the serial number of CXDI-50G

Input the serial number of CXDI-50G to communicate between CXDI-50G and DR system. Please change the setting according to the procedure.

1. 【Alt】 + 【Tab】 key to installed tool keyboard is pressed with CXDI-50G starts.
2. "Command prompt" window is displayed. It is checked that the menu of "Welcome to CCR" is displayed. The 【Esc】 key is pressed when not displayed.

- It is input by the line of "Enter item:" as "1", and presses the 【Enter】 key.



```

Microsoft Windows [Version 5.0.2600.5512]
Copyright (c) 1996-2000 Canon Inc. Medical Dept. All rights reserved.
C:\DA-00> Nov 5 2000 15:01:22
02-030541704000:***** 2000/03/02 04:04:00 STARTED (This is not ERR) *****

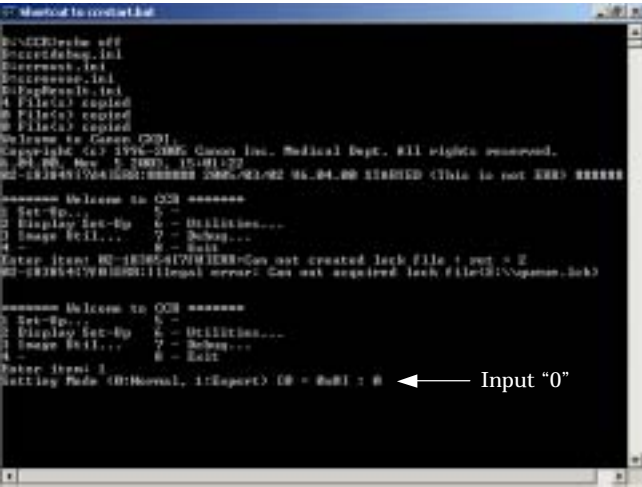
***** Welcome to ODR *****
1 Set-Up... 5 -
2 Display Set-Up 6 - Utilities...
3 Image Exit... 7 - Subsys...
4 - 8 - Exit
Enter item ID-(030541704000):Can not created lock file : opt + 2
02-030541704000:Illegal error: Can not acquired lock file(C:\Programs\lock)

***** Welcome to ODR *****
1 Set-Up... 5 -
2 Display Set-Up 6 - Utilities...
3 Image Exit... 7 - Subsys...
4 - 8 - Exit
Enter item 1

```

Fig. 4-13

- "Setting Mode..." is displayed. It is input as "0", and presses the 【Enter】 key.



```

Microsoft Windows [Version 5.0.2600.5512]
Copyright (c) 1996-2000 Canon Inc. Medical Dept. All rights reserved.
C:\DA-00> Nov 5 2000 15:01:22
02-030541704000:***** 2000/03/02 04:04:00 STARTED (This is not ERR) *****

***** Welcome to ODR *****
1 Set-Up... 5 -
2 Display Set-Up 6 - Utilities...
3 Image Exit... 7 - Subsys...
4 - 8 - Exit
Enter item ID-(030541704000):Can not created lock file : opt + 2
02-030541704000:Illegal error: Can not acquired lock file(C:\Programs\lock)

***** Welcome to ODR *****
1 Set-Up... 5 -
2 Display Set-Up 6 - Utilities...
3 Image Exit... 7 - Subsys...
4 - 8 - Exit
Enter item 1
Setting Mode (0:Normal, 1:Expert) ID = 0001 : 0

```

Fig. 4-14

5. The menu of "CCR SETUP MENU (Esc to go back)" is displayed. It is input to the line of "Enter item:" as "7", and presses the 【Enter】 key.

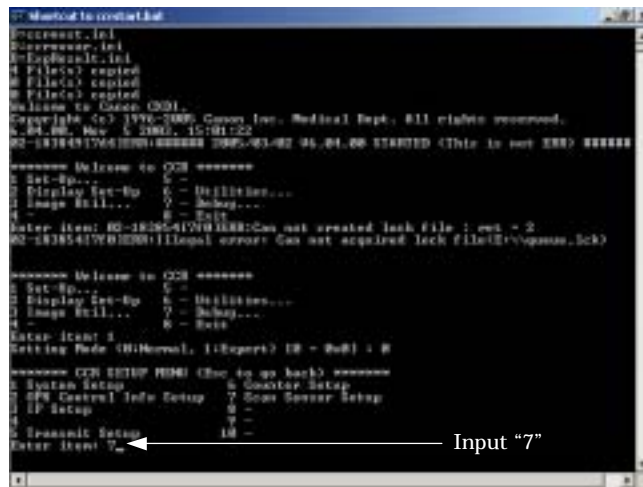


Fig. 4-15

6. "@@@Capture Devices Configuration Table@@@" is displayed. 【Enter】 The key is pressed, and it advances it to the second line.

7. "Max Capture Devices..." is displayed. It is input as "1", and presses the 【Enter】 key.

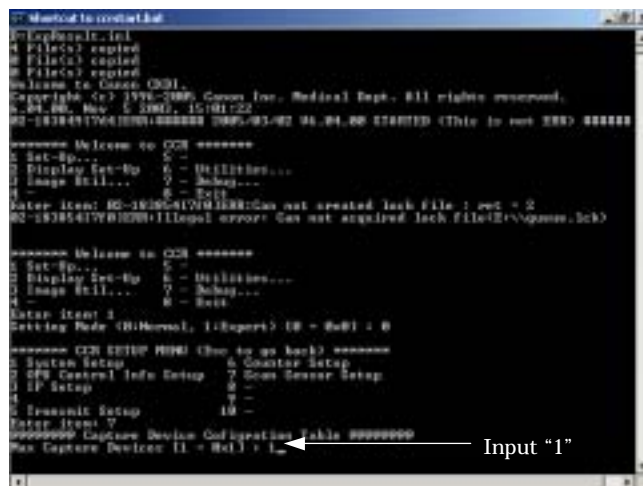


Fig. 4-16

8. "A/D Board Serial Number for Sensor ID#1" is displayed. The serial number ("*" part of 0x*****) written in the line on one step is input, and the 【Enter】 key is pressed.

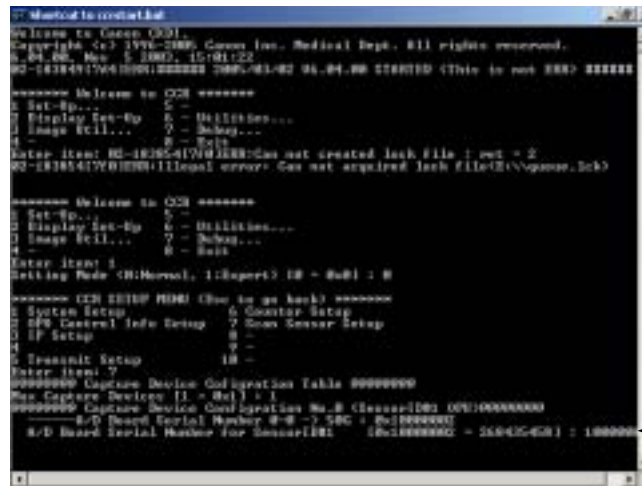


Fig. 4-17

9. The 【Enter】 key is pressed until the menu of "CCR SETUP MENU(Esc to go back)" is displayed. Check the display, the 【Esc】 key is pressed.

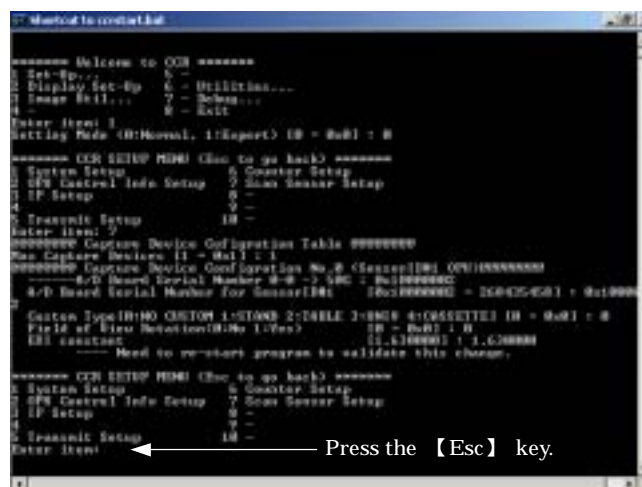


Fig. 4-18

10. The menu of "Welcome to CCR" is displayed. "8" is input to "Enter item:", and the 【Enter】 key is pressed.

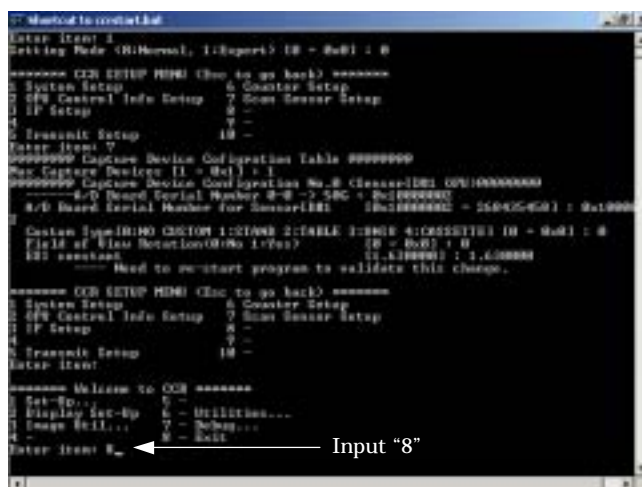


Fig. 4-19

11. It is displayed in the line of "Enter Item", "Please push some keys to continue". The 【Enter】 key is pressed.

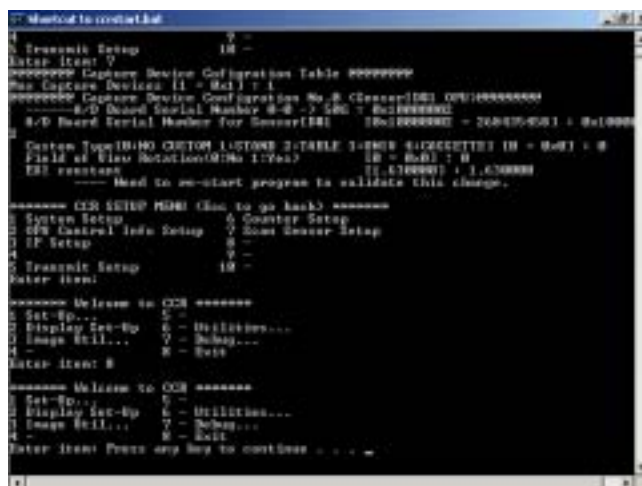


Fig. 4-20

12. Check the DR system starts normally.

The setting of the serial number of CXDI-50G is completed above.

4.5.2 Setup of Network

It is set to the network setting for CXDI. It sets it as follows by the property setting of Internet protocol (TCP/IP) of windowsXP.

- CXDI's IP address 222.111.22.30
- Sub-net mask 255.255.255.0

The printer and storage are set the output setting and the parameter setting on the user setting screen.

Refer to CANON Inc. CXDI manual's for details.

4.6 Installation of CXDI Generator Communication S/W

The following two settings is needed.

1. Installation of CXDI Generator Communication S/W
2. Change in setting of CXDI (refer to "4.7 Setup of CXDI Generator Communication S/W")

Install GCOM-JB3 according to the following procedures.
CXDI Generator Communication S/W "CANON CXDI Generator Communication Module GCOM JB3" is supplied by FD.

Please install it according to the following procedures.

- 1.* FD is insert the FDD, and the window is opened.

2. Select and open <cginst.bat> file.



Fig. 4-21

3. "Command prompt" window is displayed. The setting value is input to the following lines. As follows the installation condition input.
- To the line of "Select generator maker"「3:Shimadzu」
 - To the line of "Select anatomical code"「2:Use」
 - To the line of "Select photo timer"「1:Not use」
 - To the line of "Select through mode"「1:Not use」
 - To the line of "Select language"「2:English」
 - It is "1:Yes" in the line of "Is it OK to set-up the above selection?" ("2:No" when the mistake is found in the input of the above-mentioned).

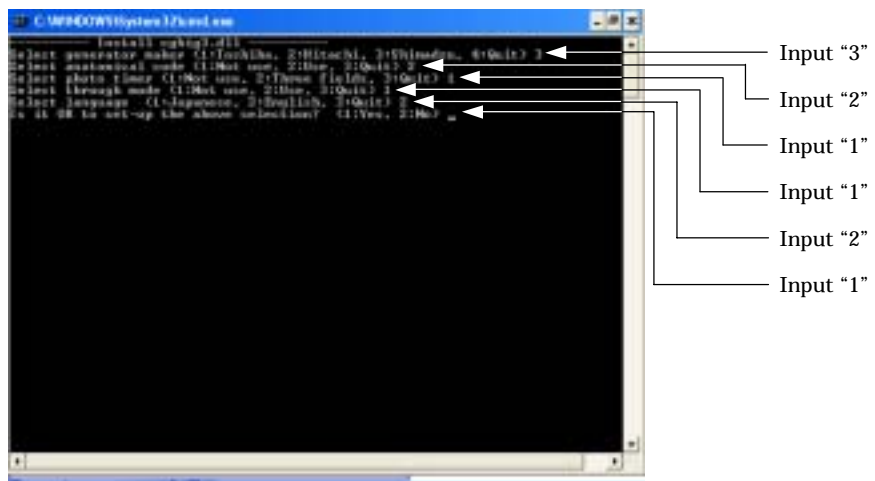


Fig. 4-22

4. A necessary file is made, and "Copy finished." is displayed. 【Enter】 The key is pressed.

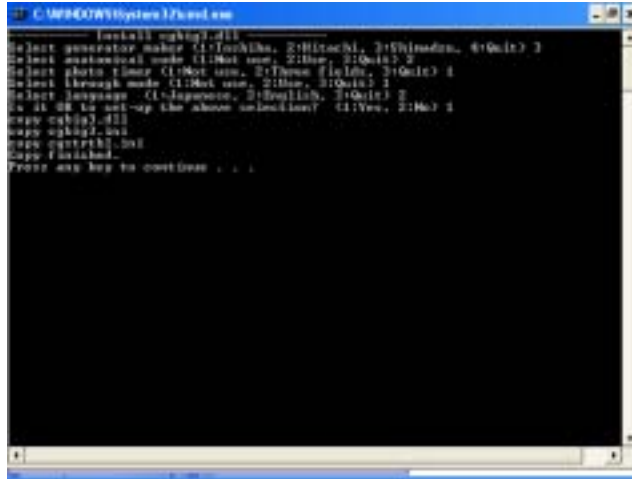


Fig. 4-23

5. It is confirmed that there is the following files in the folder 《D:\CCR》.
- <cgbig3.dll>
 - <cgbig3.ini>
 - <cgstrtbl.ini>



Fig. 4-24

The installation of the CXDI Generator Communication S/W is completed.

It is need to set the installed CXDI Generator Communication S/W. Refer to "4.7 Setup of CXDI Generator Communication S/W".

4.7 Setup of CXDI Generator Communication S/W

It is necessary to change the setting of the CXDI by installing CXDI Generator Communication S/W. As follows the procedures.

After the S/W is installed, it is necessary to change the following settings of CXDI.

1. **【SYSTEM】** is pressed on the screen where CXDI-50G started.



Fig. 4-25

2. "System menu" screen is displayed. **【SETUP MENU】** is pressed.



Fig. 4-26

3. "SYSTEM INFORMATION" screen is displayed. 【ADMINISTRATOR SETUP】 is pressed.

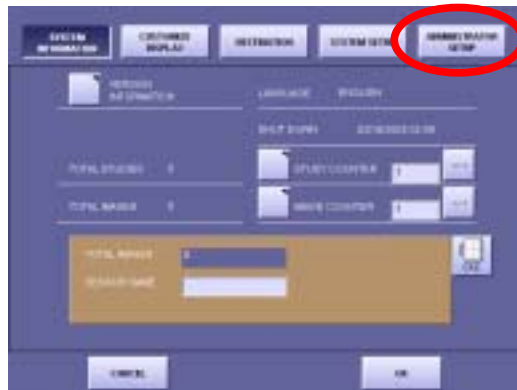


Fig. 4-27

4. "ADMINISTRATOR SETUP" screen is displayed. 【MODULE】 is pressed.

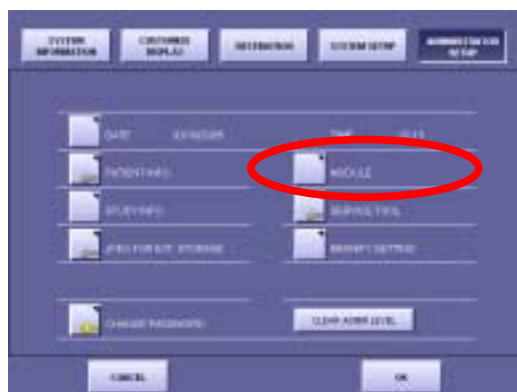


Fig. 4-28

- "HIS Module Information/Setting" screen is displayed. 'Generator' tab is pressed.



Fig. 4-29

6. "Generator Communication Module Information/Setting" screen is displayed. "Use Generator Communication Module" is pressed.



Fig. 4-30

7. "Use Generator Communication Module" becomes "VALID". "CXDI GEN" is selected.

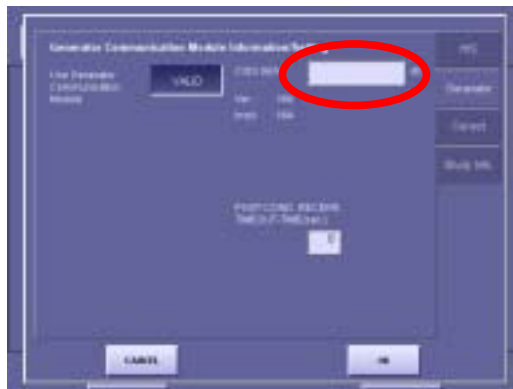


Fig. 4-31

8. A soft keyboard is displayed. It is input as "cgbig3", and presses 【OK】.

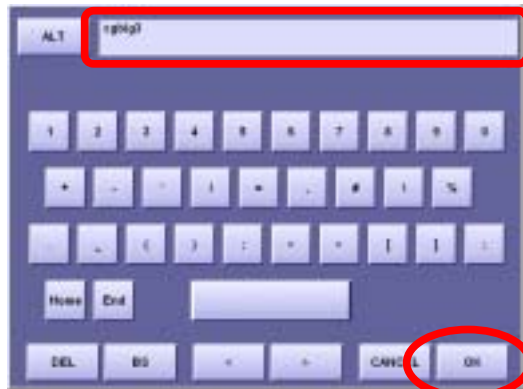


Fig. 4-32

9. It returns to "Generator Communication Module Information/Setting" screen. "POST-COND. RECEIVE TIMEOUT-TIME(sec)" is selected.

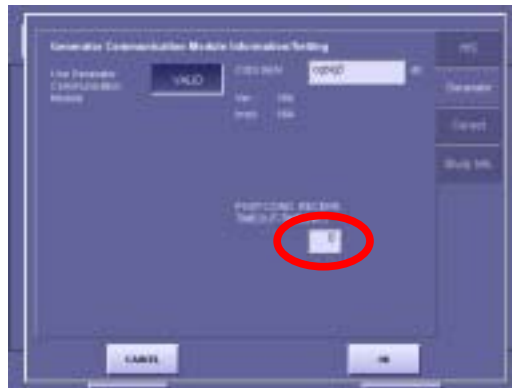


Fig. 4-33

10. A soft keyboard is displayed. It is input as "30", and presses 【OK】.

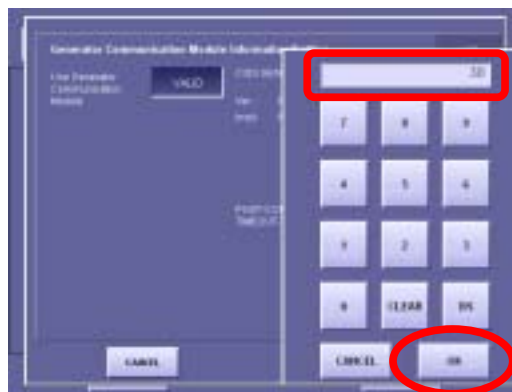


Fig. 4-34

11. "Generator Communication Module Information/Setting" screen is displayed. Check the following settings of three points are correct, 【OK】 is pressed.

- " Use Generator Communication Module " "VALID"
- 「CXDI GEN」 「cgbig3.dll」
- " POST-COND. RECEIVE TIMEOUT-TIME(sec)" "30"



Fig. 4-35

12. When you press 【OK】 that returns to "Manager setting" screen「Do you want to change the current settings?」It drinks and the message is displayed. 【OK】 is pressed.



Fig. 4-36

13. 【SHUTDOWN】 is pressed, and the PC is shutdown. Afterwards, the DR switch is pressed, and CXDI-50G is started.



Fig. 4-37

14. The exposure method is edited referring to CANON Inc. CXDI manual. 【SYSTEM】 is pressed on the screen where CXDI-50G started.



Fig. 4-38

15. "System menu" screen is displayed. 【EDIT EXPOSURE MODE】 is pressed.



Fig. 4-39

16. "EDIT EXPOSURE MODE" screen is displayed. The exposure method of changing the setting is selected. (example: Skull AP)



Fig. 4-40

17. "EDIT PARA." screen is displayed. 【GEN Com Module】 is pressed.



Fig. 4-41

18. A soft keyboard is displayed. The anatomical code transmitted from CXDI to MUX is input while referring to "Chapter E" and **【OK】** is pressed.



Fig. 4-42

19. It returns to "EDIT PARA." screen. After it is confirmed that the value input to "GEN Com Module" is displayed, 【OK】 is pressed.



Fig. 4-43

20. The message of "Save the changed parameter." is displayed. 【OK】 is pressed.



Fig. 4-44

21. "EDIT EXPOSURE MODE" screen is displayed. Other exposure methods are set repeating 16-20. After the setting of the method of exposure of all is completed, 【EXIT】 is pressed.



Fig. 4-45

The setting of CXDI Generator Communication S/W is completed above.

4.8 Check of CXDI Generator Communication S/W

Checking the operation of CXDI Generator Communication S/W installed by "4.6 Installation of CXDI Generator Communication S/W" is done according to the following procedures.

1. Exposure method is selected on the screen where CXDI-50G started.
2. Confirm the tube voltage value and the tube current value changed, and correct LEDs are illuminated on the X-Ray control panel.

The checking of CXDI Generator Communication S/W is completed above.

4.9 Use permission setting of external storage medium

The acquired data can be preserved from the USB connector of MUX-100D front panel to an external storage medium in CXDI-50G. As follows the use setting of an external storage medium according to procedures.

1. **【Alt】 + 【Tab】** key to installed tool keyboard is pressed with CXDI-50G starts.
2. "Command prompt" window is displayed. Check the menu of "Welcome to CCR" is displayed. The **【Esc】** key is pressed when not displayed.
3. It is input by the line of "Enter item:" as "1", and presses the **【Enter】** key.

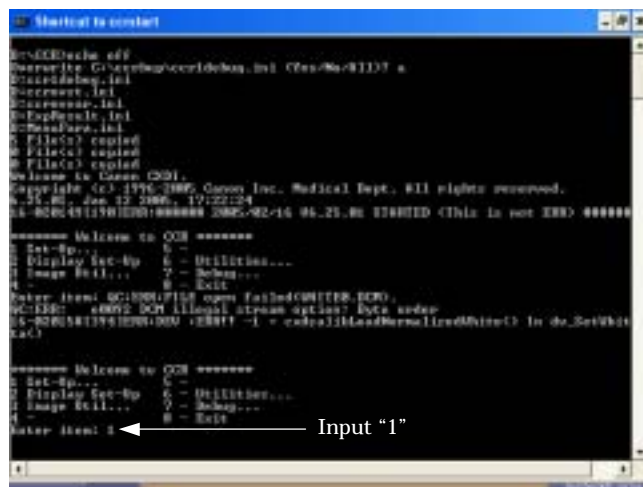


Fig. 4-46

4. "Setting Mode..." is displayed. It is input as "0", and presses the 【Enter】 key.

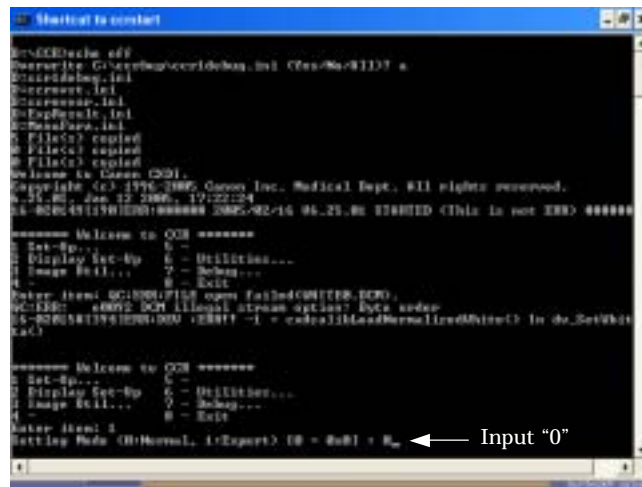


Fig. 4-47

5. The menu of "CCR SETUP MENU (Esc to go back)" is displayed. It is input to the line of "Enter item:" as "5", and presses the 【Enter】 key.

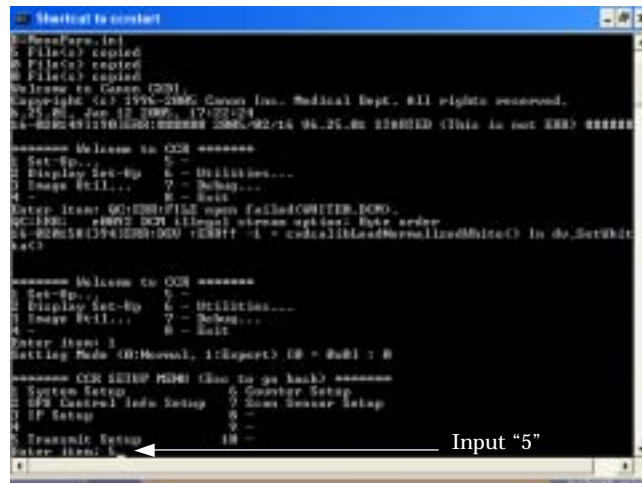
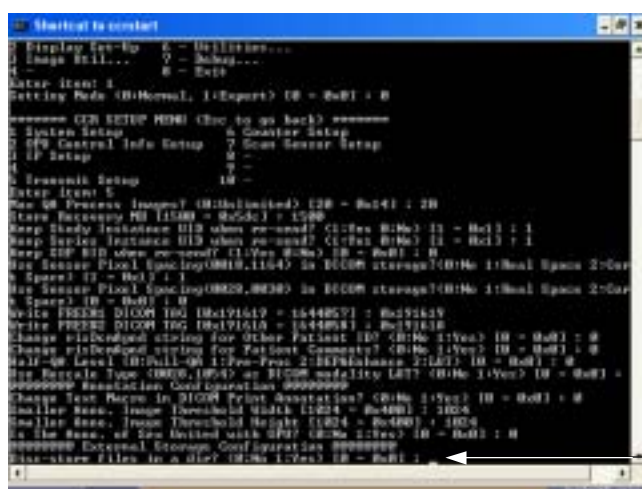


Fig. 4-48

6. The **【Enter】** key is pressed until "@@External Storage Configuration@@" is displayed.



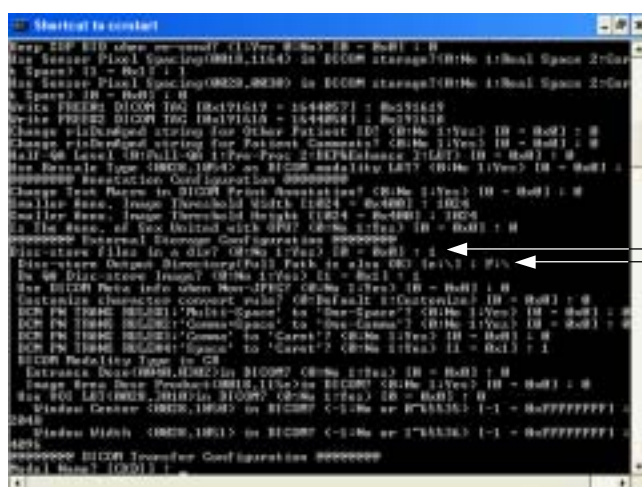
Press the **【Enter】** key until this line is displayed.

Fig. 4-49

7. The numerical value is input by the following lines, and the **【Enter】** key is pressed.

- To the line of "Disc-store files ..." 「1」
- To the line of "Disc-store output ..." 「F:\」
- To the line of "Window Center ..." 「2048」
- To the line of "Window Width ..." 「4096」

The **【Enter】** key is pressed without inputting any line that need not be input.



Input "1"

Input "F:\"

Input "2048"

Input "4096"

Fig. 4-50

8. The **【Enter】** key is pressed until the menu of "CCR SETUP MENU" is displayed. Check the menu was displayed, the **【Esc】** key is pressed.

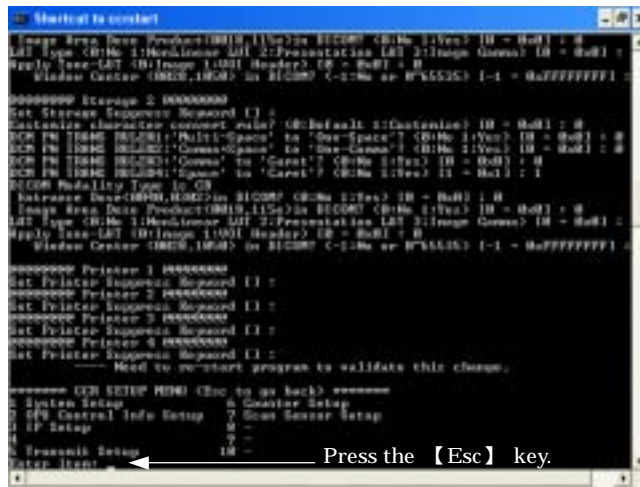


Fig. 4-51

9. The menu of "Welcome to CCR" is displayed. "8" is input to "Enter item:", and the **【Enter】** key is pressed.

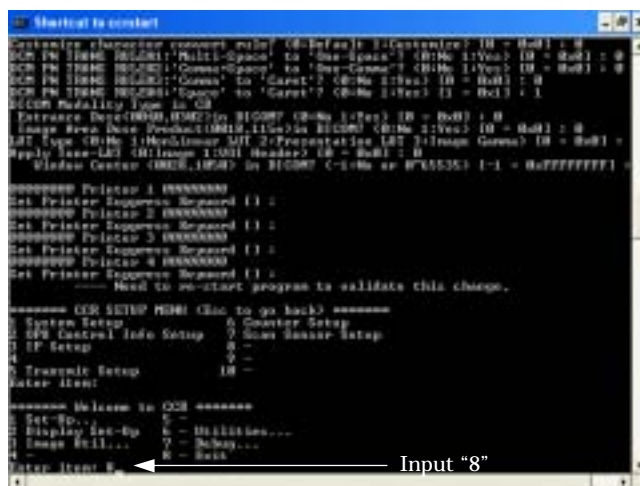


Fig. 4-52

10. It is displayed in the line of "Enter Item", "Please push some keys to continue". The **【Enter】** key is pressed.

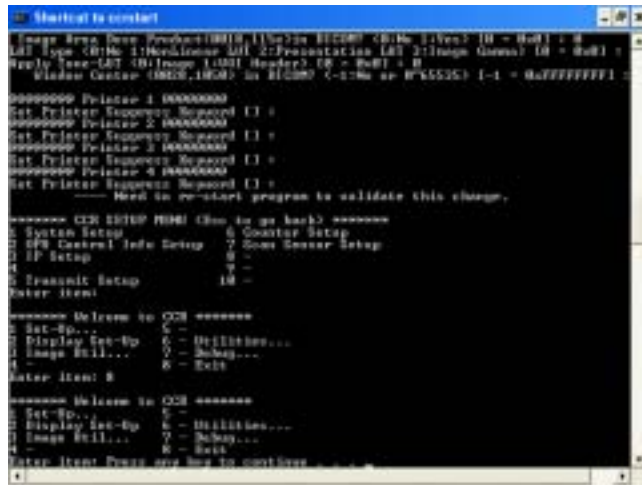


Fig. 4-53

11. CXDI is started. 【SYSTEM】 button is pressed.



Fig. 4-54

12. "System menu" screen is displayed. **【SETUP MENU】** is pressed.



Fig. 4-55

13. "SYSTEM INFORMATION" screen is displayed. 【ADMINISTRATOR SETUP】 is pressed.

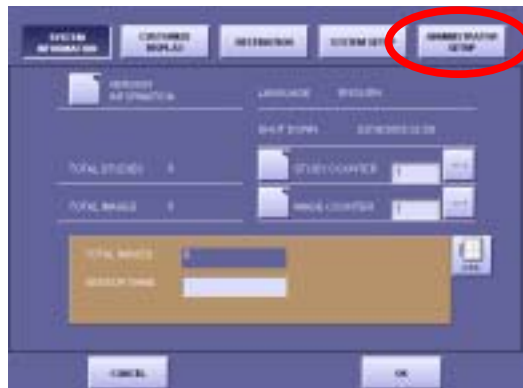


Fig. 4-56

14. "ADMINISTRATOR SETUP" screen is displayed. 【JPEG FOR EXT. STORAGE】 is pressed.

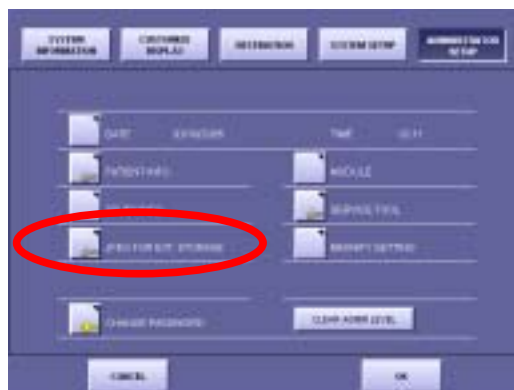


Fig. 4-57

15. "JPEG FOR EXT. STORAGE" screen is displayed. 【JPEG】 is pressed.



Fig. 4-58

16. It is confirmed that **【Loseless】** button was displayed, and presses **【EXIT】**.



Fig. 4-59

17. **【OK】** is pressed.

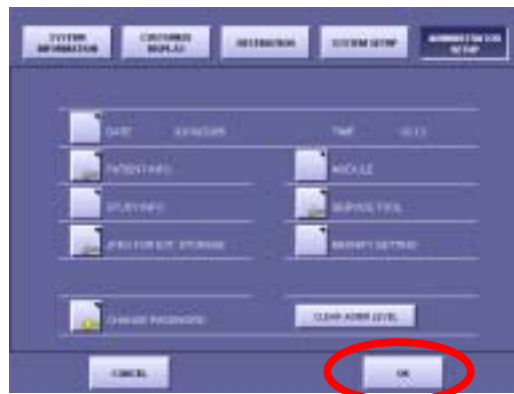


Fig. 4-60

18. **【OK】** is pressed.



Fig. 4-61

The use permission setting of an external storage medium is completed above.

4.10 Installation of MLT-M S/W (optional)

As follows the procedures image processing software MLT-M installation.

1. CD is insert the DVD-ROM drive, and the window is opened. It is confirmed that there is the following files.

- cdr2mltm.dll



Fig. 4-62

2. <cdr2mltm.dll> file is copied onto 《D:\CCR》.

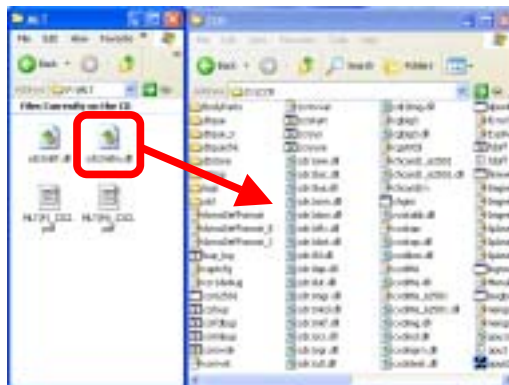


Fig. 4-63

The installation of MLT-M is completed.

Check the operation of installed MLT-M. Refer to "4.11 Check of MLT-M S/W".

4.11 Check of MLT-M S/W (optional)

Checking the operation of MLT-M installed by "4.10 Installation of MLT-M S/W (optional)" is done according to the following procedures.

1. **【SYSTEM】** is pressed on the screen where CXDI-50G started.

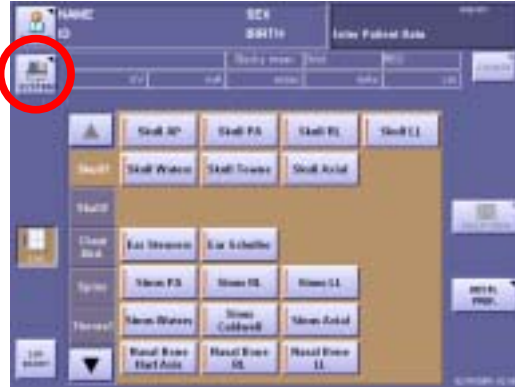


Fig. 4-64

2. "System menu" screen is displayed. **【SETUP MENU】** is pressed.



Fig. 4-65

3. "SYSTEM INFORMATION" screen is displayed. 【SYSTEM SETUP】 is pressed.



Fig. 4-66

4. "SYSTEM SETUP" screen is displayed. 【DISPLAYING PARAMETER CHANGE/QA SCREEN DURING EXPOSURE】 is pressed.



Fig. 4-67

5. "DISPLAYING PARAMETER CHANGE/QA DURING EXPOSURE" screen is displayed. 【STD. FREQUENCY】 is pressed.



Fig. 4-68

6. "Processing selection" screen is displayed. It is confirmed that 【MLT(M) FREQUENCY】 is active.

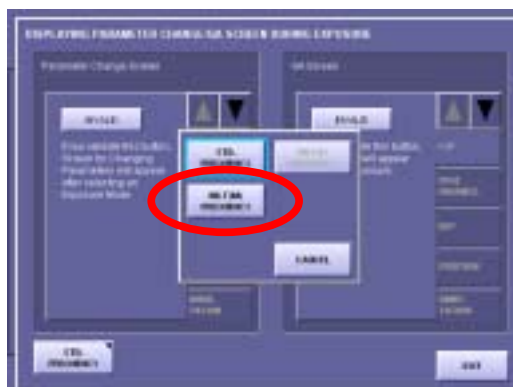


Fig. 4-69

7. When the installation of MLT-M is failed, it becomes a display as shown in Fig. 4-70.



Fig. 4-70

8. The check of MLT-M is completed above.

4.12 Calibration

4.12.1 Aging

Perform aging of the unit while checking performance of X-ray exposures. Make exposures in step 1 to step 9 (125 kV) according to "Table 4-2 Aging steps".

If anything is wrong with the unit during the aging, go back 2-steps and repeat making exposures.

To measure the tube voltage waveform, check CP9 TKV (tube voltage feedback signal 1 V/20 kV) of the XCONT-2002 board using the oscilloscope.

Table 4-2 Aging steps

Step	Tube voltage (kV)	Product of tube current and its flow time (mAs)	Number of exposures	Pause time (Sec.)
1	60	10	2	40
2	70	10	2	40
3	80	10	2	40
4	90	10	2	40
5	100	10	2	40
6	110	10	2	40
7	115	10	2	40
8	120	10	2	40
9	125	10	2	40

**WARNING**

While aging, defend enough from the radiation closing the collimator completely and using the defense apron or the screen.

4.12.2 Calibration

The calibration method is edited referring to CANON Inc. CXDI manual.

1. Setup the CXDI-50G refer to CANON Inc. CXDI manual.

The exposure condition of the calibration is aprox. 60kV, and 2mAs at the exposure distance (SID) 1m.

The calibration error might occur because of differences the exposure distance (SID) and the X-ray back scatter etc. When the calibration error occurs, the error screen is displayed in the touch panel monitor. Check the content of the error, and change the calibration condition (exposure conditions of MUX). Displayed value(%) is displayed to the average of dose product. Lower the calibration condition when the displayed value is large. Raise the calibration condition when the displayed value is small.

Set to the exposure condition used for the calibration from the touch panel monitor to CXDI-50G when the calibration ends. (In a self-diagnosis and the next calibration, the set exposure condition is displayed in the touch panel monitor as a reference exposure condition.)

4.13 Selftest

The self-test is executed referring to CANON Inc. CXDI manual. It is confirmed to pass all items.

4.14 Installation of DMW-PS (optional)

As follows the procedures software DMW-PS for the DICOM communication installation.

1. CD insert the DVD-ROM drive, and the window is opened.



Fig. 4-71

2. All contents of the folder 《DMW-V3》 are copied onto 《D:\CCR》.

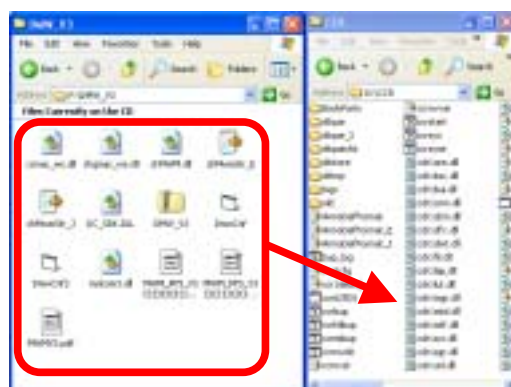


Fig. 4-72

3. Installation of DMW-PS is completed.

4.15 Setup of DMW-PS (optional)

1. DMW-PS is set according to the installation manual of CANON CXDI DMW-PS.
2. The server is set referring to the installation manual and the function manual of CANON CXDI DMW-PS.

4.16 Check of DMW-PS function (optional)

1. Connect to server and MUX-100D.
2. Make list of patient data on server.
3. Communicate server and CXDI for patient data.



Fig. 4-73

4.17 Setup of annotation

- Annotation is set referring to CANON Inc. CXDI manual.

4.18 Setup of DICOM storage and print

1. Network connection

It is storing set, sets the printer, and the parameter is set according to CANON Inc. CXDI manual.

4.19 Acquisition of image with phantom

The acquisition of image method is edited referring to CANON Inc. CXDI manual.

1. SID is set 1m.
2. Select the CXDI exposure mode button.
3. Irradiation and save the image of the phantom.

4.20 Check of REX value

Check of REX value refer to CANON Inc. CXDI manual.

4.21 Check of DICOM storage and print function

Output the image to the server and printer.

4.22 Check of image

Set the high-resolution monitor and DICOM printer by referring to their manuals.

Check that there is no artifacts and shading, etc. on the image.

4.23 Check table

Check the following table and send a copy to Shimadzu QA by FAX.

MUX-100D Serial Number _____	
CXDI-50G Serial Number _____	
Check item	Judgement
Display of Image	PASSED / FAILED
It makes X-ray exposure of the phantom arranged at the center of FPD. The image must be displayed normally on the touch monitor in about three seconds. Exposure condition : 50kV 2mAs SID 1m	
Exposure condition communicate	PASSED / FAILED
Preceding clause exposure condition must be transmitted normally. Preceding clause exposure condition is displayed on the touch monitor.	
Generator communicate	PASSED / FAILED
The protocol of CXDI must be transmitted to MUX-100D. The protocol of MUX-100D must be changed by CXDI selected.	
Network	PASSED / FAILED
The image must be sent and received correctly by DICOM regulation. The image must be printed correctly by DICOM regulation.	
Selftest	PASSED / FAILED
It is checked that do the selftest and the error doesn't appeared.	
Checker _____	
Check date _____	

SHIMADZU CORPORATION, Medical Equipment Division,
Quality Assurance Dept.
1 Kuwahara-cho, Nishinokyo, Nakagyo-ku, Kyoto 604-8511
FAX : 81-75-823-1377

4.24 Removal of 50G and Power Box from MUX-100D

CXDI-50G is separated from MUX-100D according to the following procedures.

1. The main breaker is turned off.
2. Open the cover (both Side cover, Upper cover, cable cover, and FPD box).
3. CXDI-50G is detached from MUX-100D according to the procedure from 8 to 2 of the clauses "4.3 Assemble for the CXDI-50G".
4. The covers are attached.

4.25 Packing and sending MUX-100D and 50G

1. CXDI-50G is packed to the packing box of CXDI-50G.
2. MUX-100D is packed.
3. CXDI-50G and MUX-100 are send.

4.26 Adjustment of Image quality

Adjust of image quality refer to CANON Inc. CXDI manual and MLT manual.

- Linearity check of Transfer Image Density.
- Operation Unit Gamma correction.

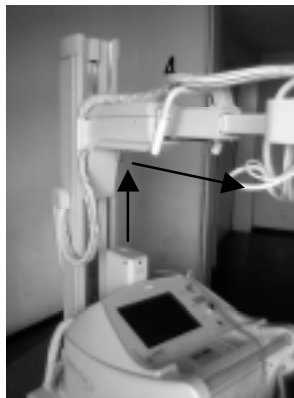
4.27 Installing the arm cover

■ Installation procedure of arm cover

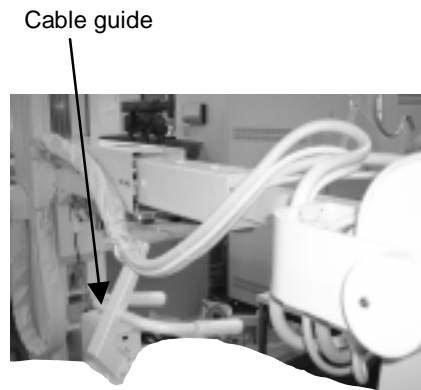
1. Lift up the arm and expand it.
2. Remove the Cable Guide from the Middle Arm. (M5 bolt, 2places. Fig. 4-74 (a))
3. Attach the Upper arm cover to the Arm. (M4 screw, 4places, Fig. 4-74 (b))
4. Attach the Lower arm cover to the Arm. (M4 screw, 6places, Fig. 4-74 (c))
5. Attach the Cable Guide to the Middle arm. (Fig. 4-74 (d))



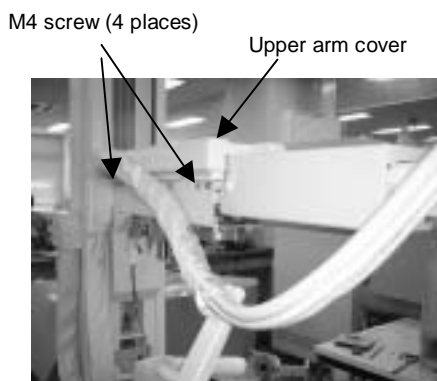
(a)



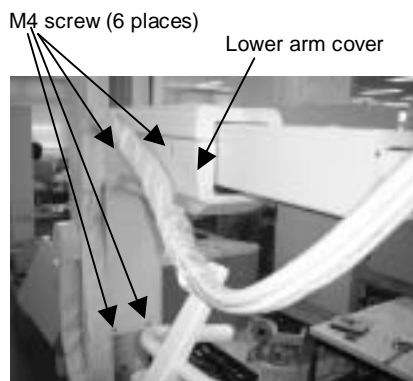
(b)



(c)



(d)



(e)



(f)

Fig. 4-74 Procedures to attach the arm cover

4.28 Attaching of a knob for locking collimator rotation

Attach a knob for locking collimator rotation. A bag is packed together with the knob and screws for adjustment of X-ray axis.



Fig. 4-75 Attaching of a knob for locking collimator rotation

4.29 Changing According to the Power Supply

Change the power plug and the connections of the connector P1 and P2 in the unit (Fig. 4-76) according to the voltage of the power supplied to use's place.

1. Turn off the main circuit breaker. (Refer to "2.1 Name of Each Part".)
2. Open the right Side cover. (Refer to Chapter 3.)
3. Change the connections of the connector P1 and P2 according to Table 4-3
4. Stick the supply voltage indication label above the outlet of the power plug. (The label is included in the maintenance parts: P/N 502-21566-01.)
5. Turn on the main circuit breaker.
6. Make sure the circuit breaker NFB1 is ON (under side).



WARNING

Be sure to change the connections according to the supply voltage at the installation site without fail. Charging the battery with wrong connections may cause burning of the electric parts or fire.

(The connections are set for 100V when the unit is shipped from the factory.)

Table 4-3 Changing the connection according to supply voltage

Supply voltage	Connector P1	Connector P2
240V \pm 10%	A0	A240
230V \pm 10%	A+10	A220
220V \pm 10%	A0	A220
200V \pm 10%	A0	A200
120V \pm 10%	A0	A120
110V \pm 10%	A+10	A100
100V \pm 10%	A0	A100

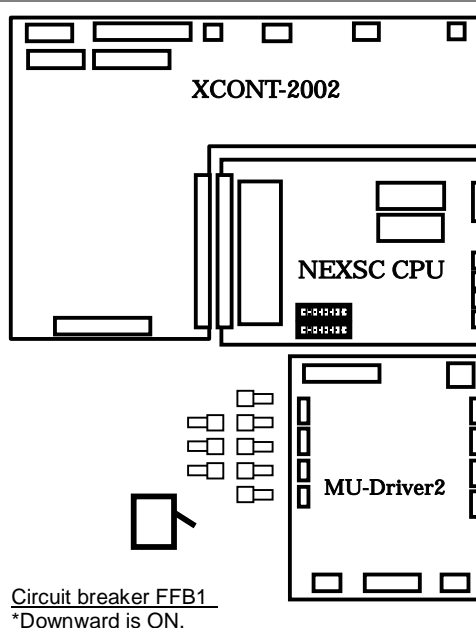


Fig. 4-76 Connector P1 and P2

4.30 Setting of XCONT

4.30.1 Setting of jumper switch on XCONT board

There are jumper switches JP1, JP2, and JP3 in a XCONT board.
Please set to O side of Table 4-4.

Table 4-4 Jumper switch setup

SW name	Silkscreen	Setup	Means
JP1	「 ON 」		Standard
	「 KC 」		KC signal is outputted to the terminal X2
JP2	「 C/C1 」		For High Voltage Trans D125PH-C/C1
	「 C2 」	×	For High Voltage Trans D125PH-C2
JP3	「 S 」		Master reset time Approx. 1.4 sec
	「 L 」	×	Master reset time Approx. 3.3 sec



CAUTION

Please should set a jumper switch JP2 to the C/C1 side, and JP3 to the S side.

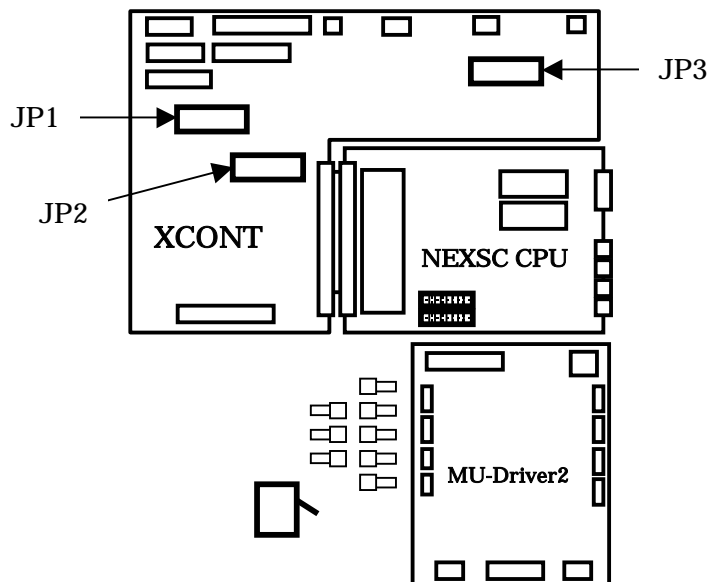


Fig. 4-77 Location of jumper switch on XCONT board

4.31 Checking Performance of Each Part



WARNING

Advance to the performance check after making sure of the connections according to the supply voltage at the installation site.

4.31.1 Check tube current

Check tube current as following steps.

1. Turn on the DIPswitch SW3-8 (adjustment mode) and SW2-5 (Measured value display mode) of NEXSC board. Turn ON the key switch.
2. Enter the tube current two-point adjustment mode. (See B.3)
3. Check that tube current value displayed on panel is within the range below. Adjust tube current when the tube current is not within the range.
 1. 80kV, 50mA : 45 - 48 mA
 2. 80kV, 160mA : 148 - 155mA

4.31.2 Checking Movement of the Collimator Unit

Make sure that the collimator is securely mounted.

1. Loosen the rotation-lock screw for the collimator.
2. Check to be sure that there is no rattle on the rotation of the collimator section.

Make sure whether the light field is normal.

1. Turn the Irradiation field adjusting knob completely open.
2. Confirm the light field pushing the collimator lamp switch.
3. Turn the Irradiation field adjusting knob completely close.
4. Confirm the light field is completely shaded pushing the collimator lamp switch.

To match the centers of aperture and X-ray focus, refer to appendix E-6.

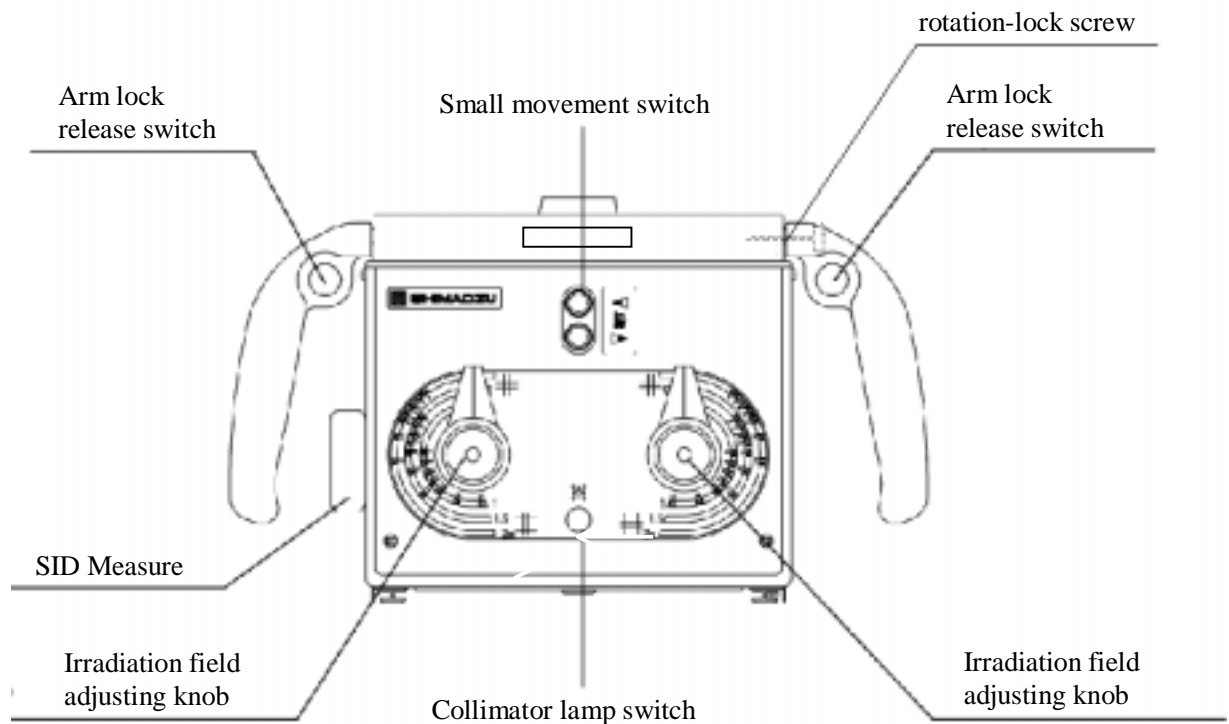


Fig. 4-78 Name of parts of the collimator

4.31.3 Checking Movement the Unit

Confirm functions of the driving handle and the small movement switch. The small movement switch is in front of the collimator.

1. Turn on the key switch. (Refer to Chapter 2.1)
2. Confirm the unit runs to forward pushing the driving handle.
3. Confirm the unit runs to backward pulling the driving handle.
4. Lift up the X-ray tube assembly pushing the arm lock release switch.
5. Confirm the unit runs to correct direction pushing the small movement switches.
6. Confirm the unit stop pushing the both small movement switches at the same time.



Safety function works when the driving handle is pushed or pulled, and the small movement switch does not work.

Small Movement Switch
(To Forward)

Small Movement Switch
(To Backward)



Fig. 4-79 Small movement switch

4.31.4 Checking the each parts movement and the lock function

Checking the arm slide, up/down and rotation movement.

1. Move the slide, up/down and rotation of the arm with press the "arm lock release switch". Confirm whether there are neither abnormal noise nor stroke shortage.
2. Confirm "arm lock release switch" is released, and the arm locks.

4.32 Initial setting

Before setting initial settings, turn ON DIP switch 2-8 on the NEXSC CPU board and turn ON the key switch. Operation described in this section is not necessary if set values for the items below do not need to be changed.



NOTE

Make sure to return the DIP switch to its original state after initial setting.

4.32.1 Setting of battery type



NOTE

Setting of battery type set factory-shipping.

Changing this set code need not to be done when installation.

Set code	Type of Battery (Manufacturer)
0	OLD PXL12072 (Japan Storage Battery) Manufacture date No.-000703
1	LC-P127R2 (Matsushita Battery Industry Co. Ltd.)
2	Not used
3	NEW PXL12072 (Japan Storage Battery) Manufacture date No.-000712
4	PX12090 (Japan Storage Battery)

1. The set code is displayed at the ones digit of the tube current time product display.
Set the set code by using tube current time product key (+). Every time the key (+) is pressed, the code changes one. (4→0→1→2→3→4)
2. Keep pushing the program registration key until being displayed as "CAL END" to register the set code.

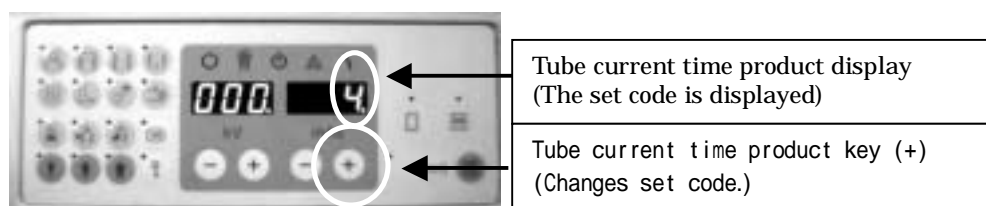


Fig. 4-80 Setting of battery type



WARNING

A Characteristic of battery depends on each battery type.

A wrong setting of code may causes the unit to malfunction and may cause electrical component to be damaged by a fire or fire occurs.



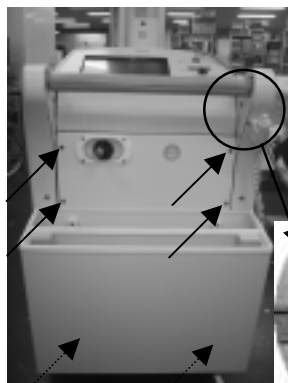
NOTE

Standard Battery is recommended in order to be operated with full performance of the unit.

Other batteries can not make the unit work with full performance.

4.33 Attaching screw caps

Attach screw caps on the places shown in Fig. 4-81. Screw caps are included in spare parts.



Side cover: 4 places (8 places in total for left and right)



Collimator upper part: 2 places



FPD box: 4 places



Top cover: 3 places



Cable cover: 4 places

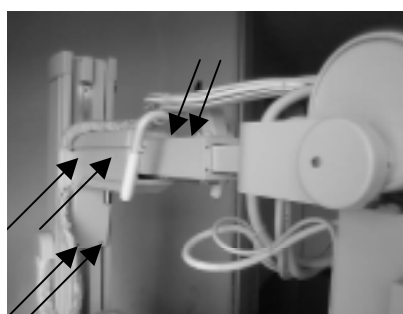


Front cover: 4 places,

Front rear cover: 2 places,

Support stand cover: 4 places

10 places in total



Arm cover: 6 places

Middle arm part: 2 places

Fig. 4-81 Places to attach screw caps

4.34 Charging the Battery after installation

In order to make the battery stable after installation, charge the battery after using it as much as the red LED of the battery indicator comes on. Instruct users of the unit to repeat three times the cycle of charging and discharging the battery. (Refer to "4.8 Charging the Battery" in the Operation manual.)

4.35 Installing an apron hanger

Do when the user wants to change the position where the apron hanger is installed.

■ Installation procedure of apron hanger

1. Remove the screw two places of the upper surface of top cover, and remove the top cover.
2. Remove the screw which installs the apron hanger, and install the apron hanger in the arbitrary position shown in Fig. 4-82.

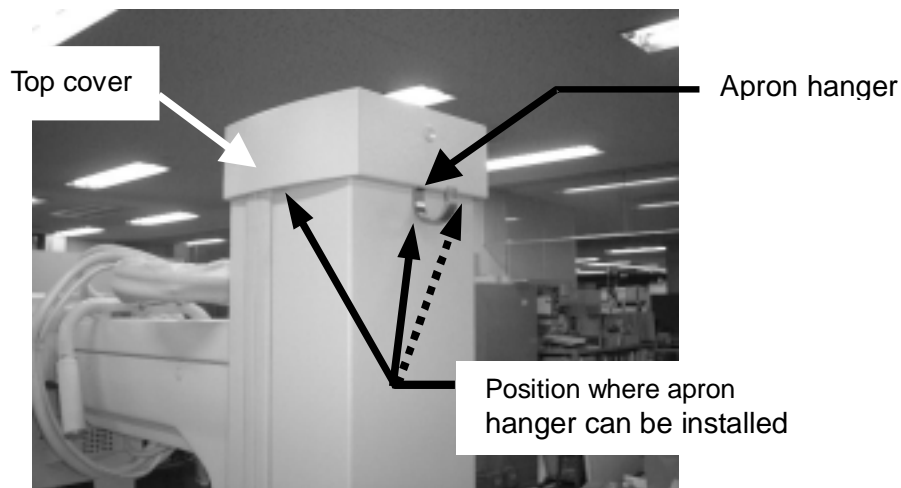


Fig. 4-82 Apron hanger

4.36 Assembler Test

In USA, execute the assembler test according to the attached ASSEMBLER TEST MANUAL (Document No.M503-E318).

Chapter 5

5

Installing the Options

How to install the options is described in this Chapter.

Chapter Contents

- **5.1 Setting DIP Switches on NEXSC Board**
The settings required to operate the options are described.
- **5.2 Installing Remote Control Option**
How to install the remote control option is described.
- **5.3 Installing Protective Screen Option**
How to install the protective screen option is described.
- **5.4 Installing Dose Area Meter Option**
How to install the dose area meter option is described.

5.1 Setting DIP Switches on NEXSC Board

Set the following DIP switches according to the options:

DIP switch No.	Description	Setting	Status
3-4	Remote controller option	ON	ENABLE
		OFF	DISABLE

No DIP-switch settings are needed for the protective screen option, large cassette box option, or grid case option.

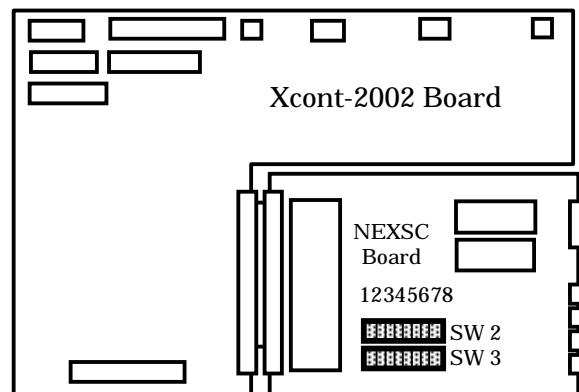


Fig. 5-1 Arrangement of DIP switches

5.2 Installing Remote Controller Option

Turn ON the DIP switch SW3-4 to make the remote controller option effective.

Component of Remote Controller Option

The Remote controller option (P/N 502-21343-03) is composed by the following parts. Confirm whether all parts become complete at an open bale.

	Parts Name	Quantity
1	RC Transmitter	1
2	RCCable	1
3	Receiver ASSY	1
	AA battery	2



1



2



3

Fig. 5-2 Component of Remote controller option

Mounting the Photo-Receptor

■ Procedures for mounting the photo-receptor:

1. Remove the side covers, the top cover and the cover of the arm joint section. (Refer to Chapter 3.)
2. Connect the attached cable to the photo-receptor for the remote controller (Fig. 5-3).
3. Mount the photo-receptor for the remote controller in place of the removed cover of the arm joint section. Use the resin top cover and socket head bolt that have been attached as they are.
4. Connect and layout the cable extending from the photo-receptor for the remote controller to JREM of XCONT-2002 board as shown in Fig. 5-4
5. Attach the removed covers again.

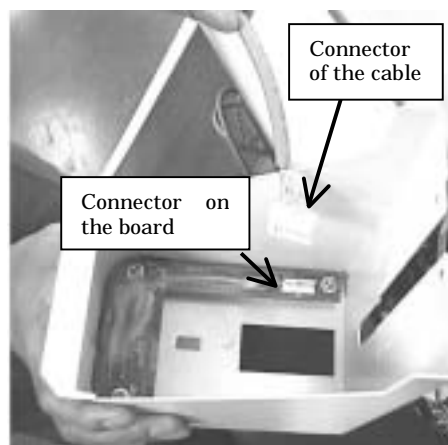


Fig. 5-3 Wiring to the photo-receptor for the remote controller option

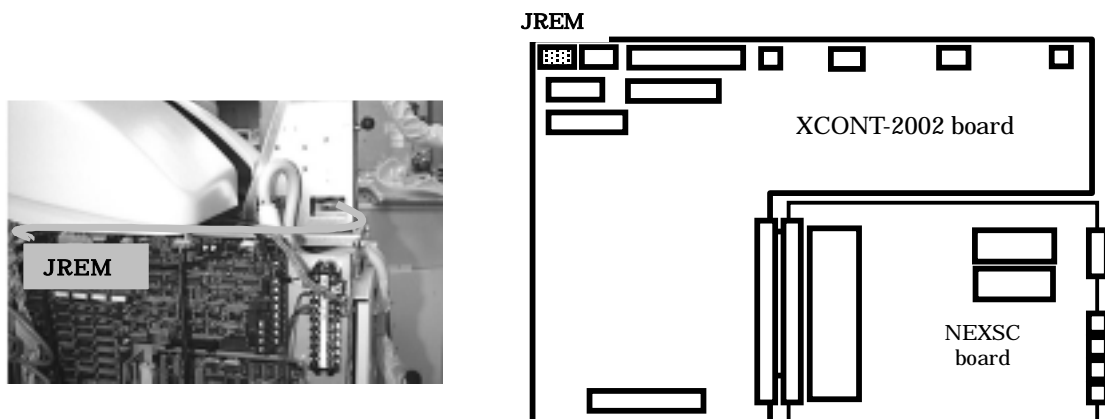


Fig. 5-4 Wiring to the XCONT-2000 board for the remote controller option

Checking Performance of the Remote Controller

First, open the lid at the back of the remote controller, and insert two "B" size batteries. To enable the function of the remote controller, turn on the lamp by pressing the remote controller key on the X-ray operating panel of the main unit (Fig. 5-5).

After finishing the preparations, check the performance of the keys listed in Table 1. Transmit from the slash range shown in Figure 5-7 to the arm attaching part.



Fig. 5-5 Remote Controller switch

Table 1 Name and basic function of each key of the remote controller

Key	Name	Normal function
	Exposure preparation switch	Starts the preparation for exposures.
	Exposure switch	Pressing this switch together with the exposure preparation switch makes exposures.
	Collimator lamp switch	Turns on/off the collimator lamp.

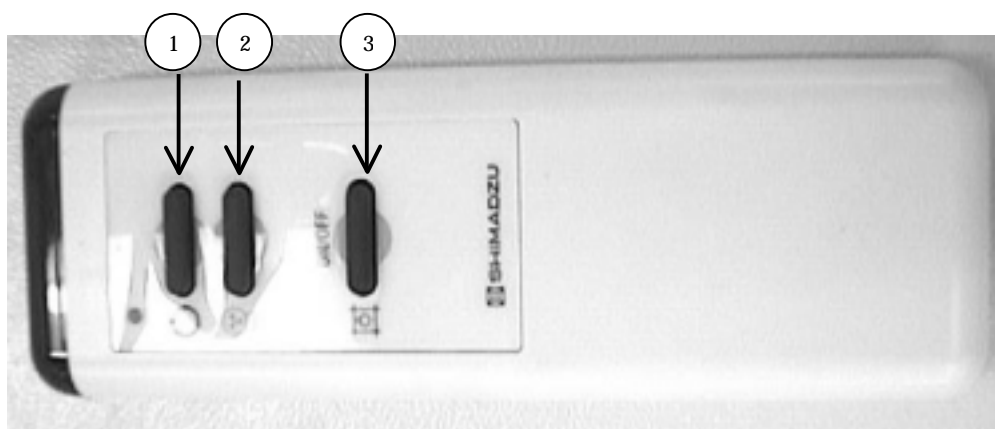


Fig. 5-6 Remote controller

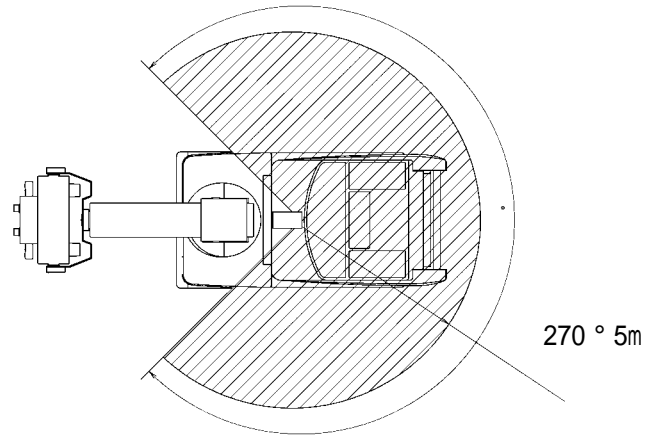


Fig. 5-7 Range where remote control can be operated

5.3 Installing Protective Screen Option

Component of Protective Screen Option

The Protective screen option (P/N: 503-50338) consists of the following parts.
Make sure that all these parts are contained in the package.

	Parts Name	Quantity
1	Protective screen	1
2	Rail	1
3	Rail mount	2
	Screw, Flat head screw SUS M4x8	4
	Bolt, HEX SKT head bolt M4x10	2

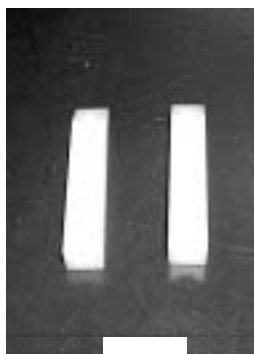


Fig. 5-8 Component of Protective Screen Option

Installation of the Protective Screen Option

Procedures of installation of the Protective screen option:

1. Screw two rails on rail mount at annex four M4x8 screws.

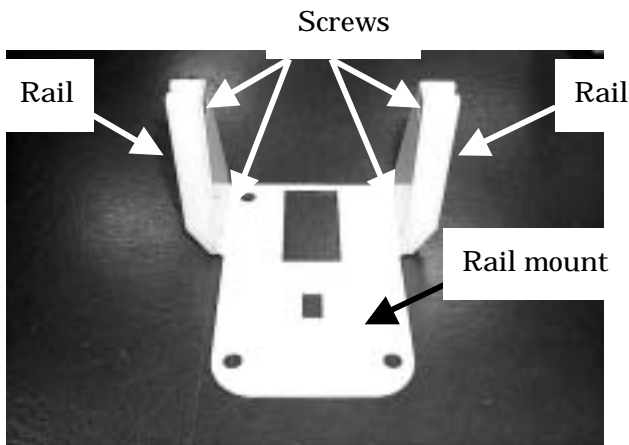


Fig. 5-9 Screw rail on rail mount

2. Unscrew two screws at Top plate. Remove Arm lock release lever knob. Remove Top plate and Arm lock joint section cover. Remove Spacing plate.

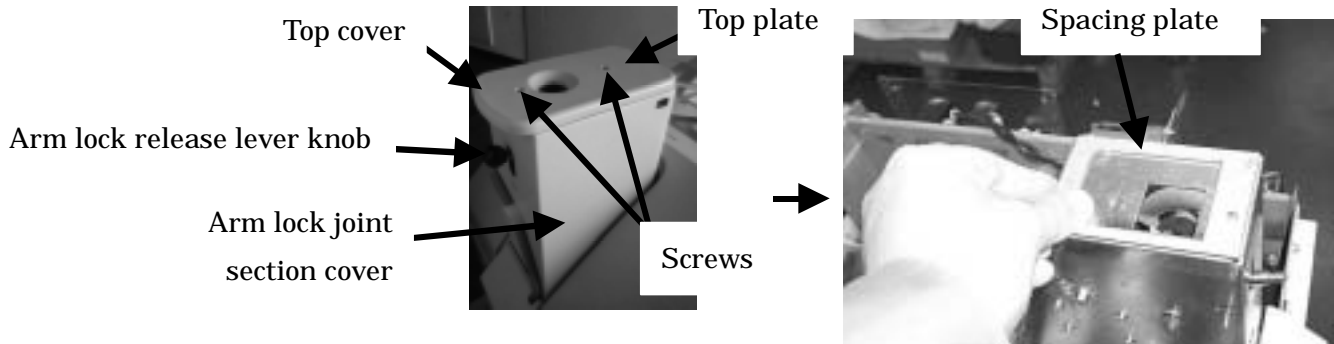


Fig. 5-10 Remove Arm lock joint section cover

3. Put Arm lock joint section cover on Arm lock joint section. Fix Arm lock release lever knob. Put Rail mount on Arm lock joint section cover.

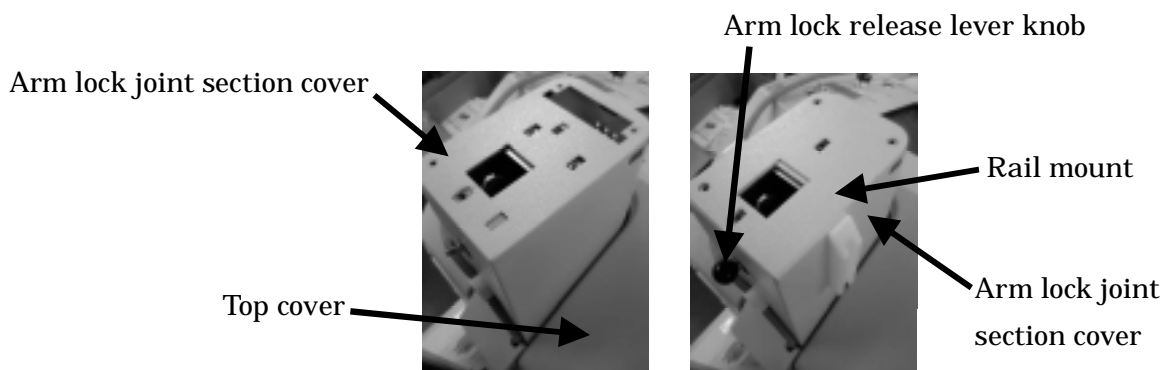


Fig. 5-11 Mounted Rail mount

4. Put Top plate on Rail mount. Screw Top plate on Rail mount. Check the setting of Protective Screen.

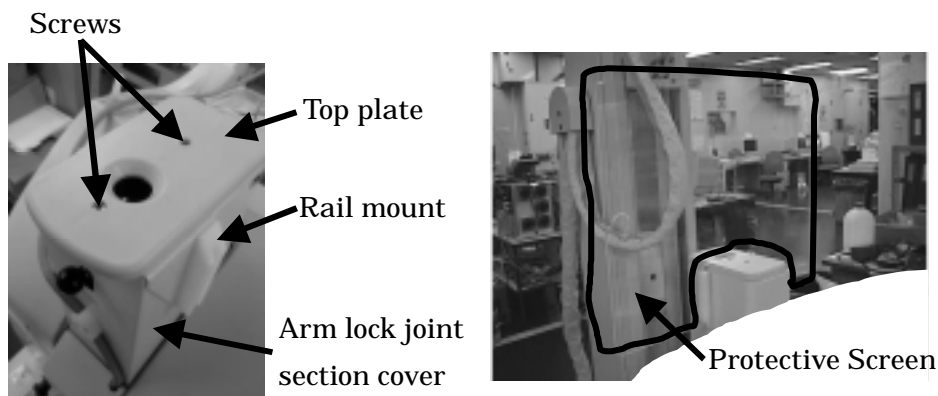


Fig. 5-12 Fixed Top Plate

5.4 Installing Dose Area Meter Option

Component of Dose Area Meter Option

The Dose Area Meter Option consists of the following parts. Make sure that all these parts are contained in the package.

	Parts Name	Quantity (UL)	Quantity (Except UL)
1	Area Dosimeter	1	1
2	Area Dosimeter Adapter	1	1
3	JDAP2 Cable	1	1
4	Sub Weight	2	2
5	Rubber sheet		1
6	Cover	1	
7	Cover Stay	2	
	Bolt ,Steel Hexsoch M3X6 ZN(Y)	2	2
	Screw , SST Bind M3X6	4	

Installing Dose Area Meter Option

Procedures of mounting

1. Attach the adapter of the dose area meter on the rails of the collimator with M3 screws.

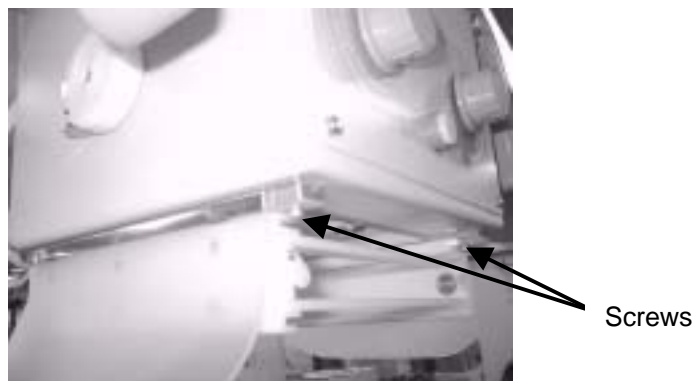


Fig. 5-13 Mounting the adapter

2. Place the dose area meter in the adapter and fix it with the push screw on the side of the adapter.

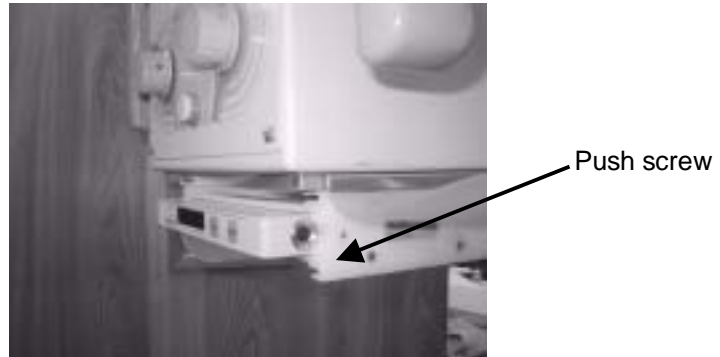


Fig. 5-14 Mounting the dose area meter

3. Detach the arm cover.



Fig. 5-15 Detach the arm cover

4. Connect the power cable of the dose area meter. Relay the power cable under the arm.
 - The power cable is wired from the main unit to the arm before shipment.
 - Wire the dose area meter's cable along the collimator's cable.
 - Relay the cable under the arm.

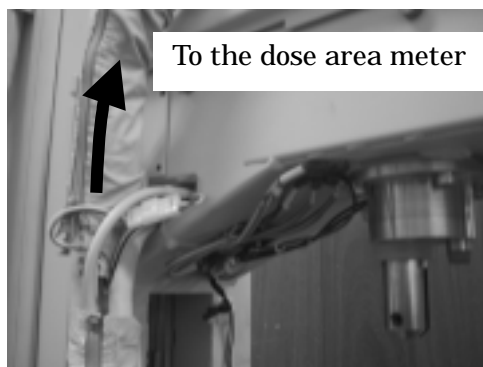


Fig. 5-16

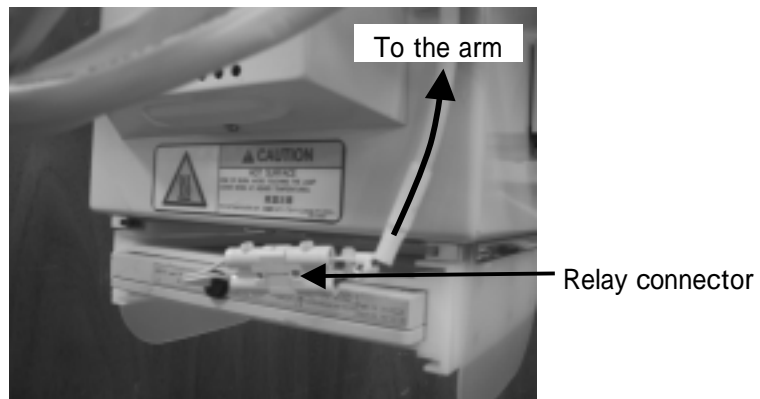


Fig. 5-17

Adjustment of vertical motion balance

Adjustment procedure

5. The top cover is detached.
6. The arm part is lowered most below, and the weight part in the column is lifted to the uppermost part.



Fig. 5-18

7. Two supplementary weights are installed, and the vertical motion balance of the arm part is adjusted.

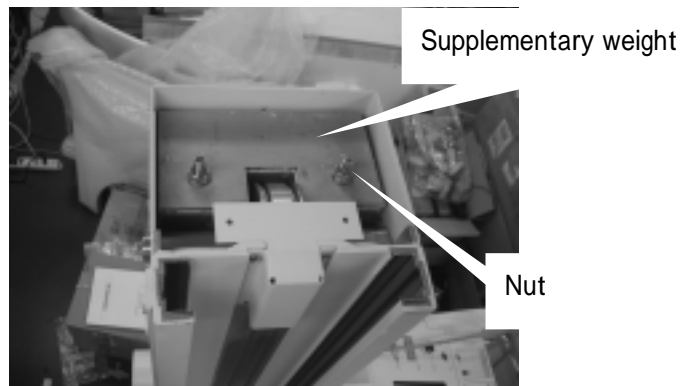


Fig. 5-19

Chapter 6



Specifications

Chapter Contents

- 6.1 Specifications
- 6.2 Dimensional Drawing of the Unit
- 6.3 X-ray Reference Axis and Focal Spot Position
- 6.4 Exposure Condition

6.1 Specifications

		MUX-100D		MUX-100DJ	
Use environment					
	Atmospheric pressure	700 ~ 1060hPa			
	Ambient temperature	10 ~ 35			
	Relative humidity	30 ~ 75%			
Common specifications					
	Total width	580mm			
	Total length	1250mm			
	Height of support stand	1930mm		1780mm	
	Weight	394 kg (with imaging unit)			
	Maximum running speed	5 ± 0.5km/h(this may vary depending on the floor condition.)			
	Imaging unit storage	1 Imaging unit			
	Focus height	600 ~ 2010mm		600 ~ 1860mm	
	Arm length	635 ~ 1200mm			
	Support stand rotation range	± 270deg.			
	Tube rotation angle	± 180deg			
	Tube rotation around tube axis	Forward: 90 deg.; Backward: 20 deg.			
	Minimum distances between Focal Spot and Image Receptor	312mm			
Power supply					
For battery drive:	Supply voltage	Built-in battery			
	Battery type	Shielded lead storage battery (12 V x 20 cells)			
For battery charge:	Rating of power supply	1kVA			
	Supply voltage	Single phase AC 100,110,120,200,220,230,240V			
	Supply Impedance	Single phase AC 100,110,120 V : No more than 1.0 Single phase AC 200,220,230,240 V : No more than 4.0			
	Supply frequency	50/60Hz			
	Earth resistance	Earth terminal : No more than 100 Additional earth terminal : No more than 100			
Power cable length		4m			

		MUX-100D	MUX-100DJ
High-voltage generator			
Nominal electric power		12.5kW (100kV、125mA、0.1s) (The product of the current allowed to flow for 0.1 seconds at a tube voltage of 100 kV and tube voltage)	
Ratings	The nominal maximum tube voltage and the maximum tube current allowed to flow at the nominal maximum tube voltage	125kV、100mA	
	The maximum tube current and the maximum tube voltage that allows the maximum tube current to flow	160mA、80kV	
	The combination of the tube voltage and tube current that output the maximum electrical power	125kV、100mA 100kV、125mA 80kV、160mA	
	The minimum value of the current time product	0.32mAs	
	The maximum value of the current time product	320mAs	
	The minimum value of nominal irradiation time	3.2ms	
The current time product that can be set with the X-ray tube voltage	40 ~ 90kV	0.32 ~ 320mAs	
	91 ~ 100kV	0.32 ~ 280mAs	
	101 ~ 110kV	0.32 ~ 250mAs	
	111 ~ 120kV	0.32 ~ 220mAs	
	121 ~ 125kV	0.32 ~ 200mAs	
Setting and display of tube voltage for exposure	Range of the setting:	40 ~ 125kV、in 1-kV increments	
	Display:	Digital display	
Accuracy	X-ray tube voltage	Less than 10%	
Setting and display of radiographic current time product.	Range of the setting:	0.32 , 0.36 , 0.40 , 0.45 , 0.50 , 0.56 , 0.63 , 0.71 , 0.80 , 0.90 , 1.0 , 1.1 , 1.2 , 1.4 , 1.6 , 1.8 , 2.0 , 2.2 , 2.5 , 2.8 , 3.2 , 3.6 , 4.0 , 4.5 , 5.0 , 5.6 , 6.3 , 7.1 , 8.0 , 9.0 , 10 , 11 , 12 , 14 , 16 , 18 , 20 , 22 , 25 , 28 , 32 , 36 , 40 , 45 , 50 , 56 , 63 , 71 , 80 , 90 , 100 , 110 , 125 , 140 , 160 , 180 , 200 , 220 , 250 , 280 , 320mAs	
	Display:	Digital display	
Accuracy	X-ray tube current time product	Less than 10%+0.2mAs	
Anatomical program		Up to 72 kinds of anatomical programs can be stored. (72 kinds = 8 body parts × 3 orientations × 3 body thickness) The contents of anatomical program stored in memory are: (a) Exposure condition (kV, mAs) (b) Method of exposure	

		MUX-100D	MUX-100DJ
Collimator		R-20C	
Field	Shape	Rectangular	
	Max. field	430 × 430 mm SID 1m	
	Min. field	0 × 0mm (leaves overlapped)	
Light field	Average illumination	> 160 lx	
	Contrast ratio of edge	> 3	
	Accuracy	2% of SID	
	Display of center	Cross lines	
	Type of lamp	Halogen lamp (12V, 100W), #55939	
	Illuminating period	30 seconds, with automatic turn-off time switch	
Field size indication	SID indicated	1, 1.5, 2 m	
	Dimensions indicated	20(8), 23(9), 25(10), 28(11), 30(12), 36(14), 43(17) cm(in.)	
	Accuracy of SID indication	5%	
Drive of leaves		manual	
Mounting dimension (Focus to fit surface distance)		56 mm	
External dimension (W × D × H)		202 × 211 × 200 mm	

X-ray tube Assembly*

Model Name		0.7U163CS-36
Spot size		0.7mm
Target angle		16deg
Nominal X-ray tube Voltage	Radiography	125kV
X-ray tube Assembly	Max. Heat	750kJ(1060kHU)
	Max. Continuous heat dissipation rate	120W(170HU/s)
X-ray Tube	Max. Anode heat dissipation rate	212kJ(300kHU)
	Max. Anode heat dissipation rate	800W(1130HU/s)
	Max. Continuous heat dissipation rate	210W(300HU/s)
	Weight	13kg

Battery

Type	Small sized value regulated lead-acid battery
Specification	12V
Quantity	20 pieces

Minimum specific filtration

Total	2.5 mm Al 70 kV
X-ray tube assembly	Equivalent to 1.5 mm Al 70 kV
Multi-leaf collimator	Equivalent to 1.0 mm Al 70 kV

Classification of the system

Method of protection against electric shock	Class (only during charging) Internal powered (during powered by internal battery)
Degree of protection against electric shock	Type-B
Classification according to operation mode	Continuous operation with intermittent load

*For detail about X-ray-tube assembly, please refer to X-ray tube operation manual (M535-E219).

CXDI-50G

CXDI	
Effective range	35 x 43 cm
Effective Number of Pixels	2208 x 2688
Pixel Pitch	160 μ m x 160 μ m
Imaging Unit mass	4.8kg (except Grid)
Mechanical strength	Load uniformly: 150kg Load partly: 100kg/ ϕ 40mm
Mass	4.8 kg (Except cable)
Attenuation equivalent of front panel	0.2mmAl.Eq.
Maximum irradiation time	1000msec
Dimension	491(W) x 477(D) x 23(H)mm with operation grip
Grayscale	12bit (4,096 grayscale)
Option	
Grid	Attenuation equivalent: 2.3mmAl.Eq.

For detail about CXDI, please refer to CXDI series operation manual (Canon CXDI Digital Radiography).

Options	MUX-100D	MUX-100DJ
Remote controller	Infrared type Ready operation, X-ray operation, Collimator lamp ON/OFF	
Removable X-ray protective screen	Removable X-ray protective acrylic screen	
Dose Area Meter	Indicates the dose area, product.	
Grid	Refer to CXDI manual	

6.2 Dimensional Drawing of the Unit

System dimensional drawing

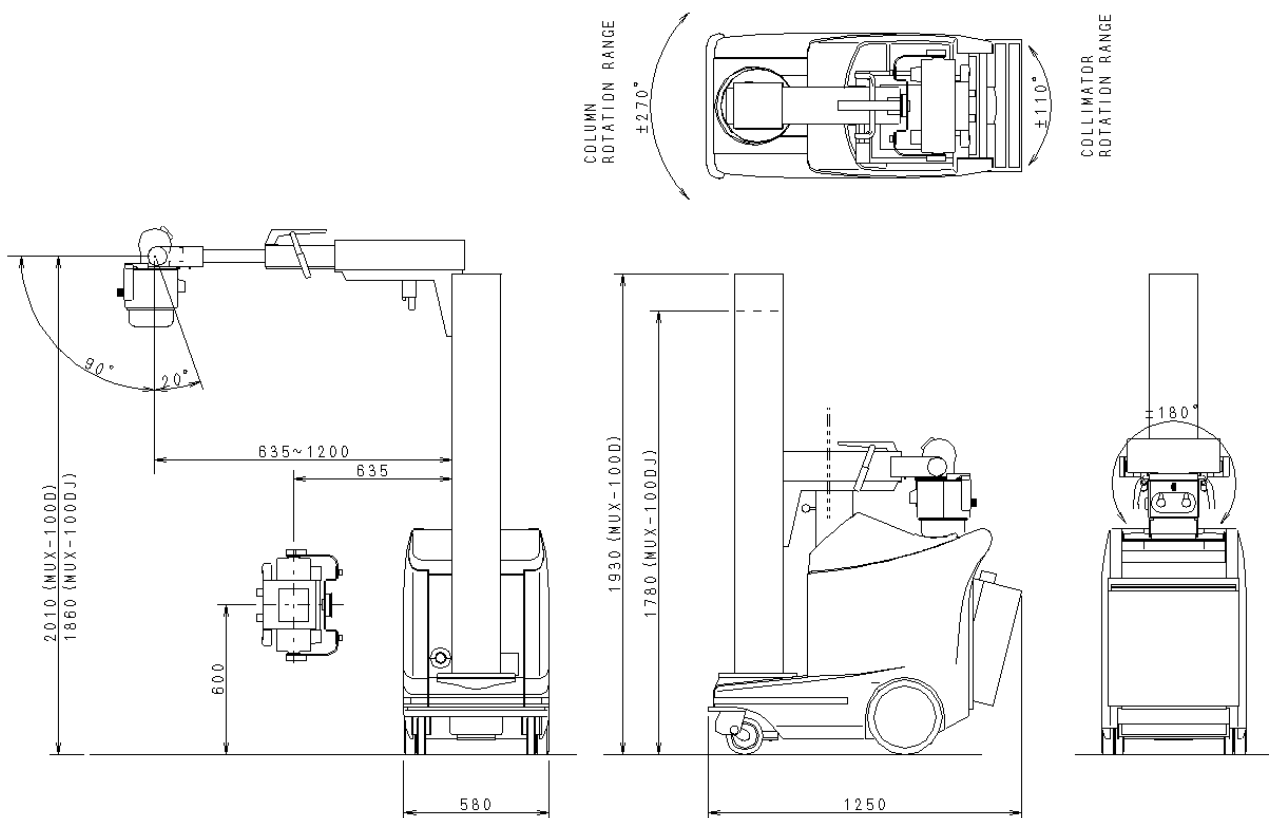


Fig. 6-1 System dimensions

6.3 X-ray Reference Axis and Focal Spot Position

X-ray reference axis and focal spot position

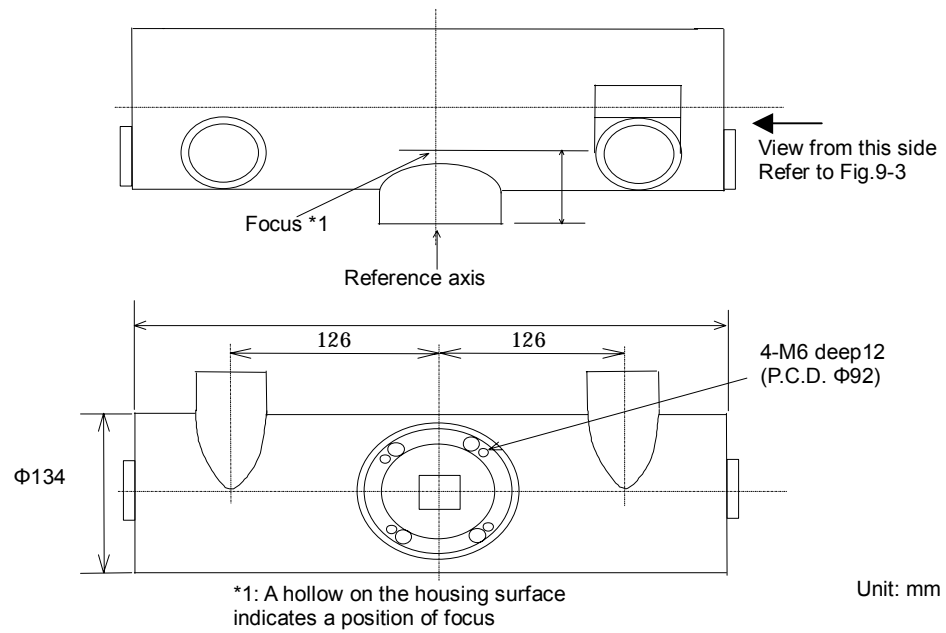


Fig. 6-2 X-ray reference axis and focal spot position (Front and upper view)

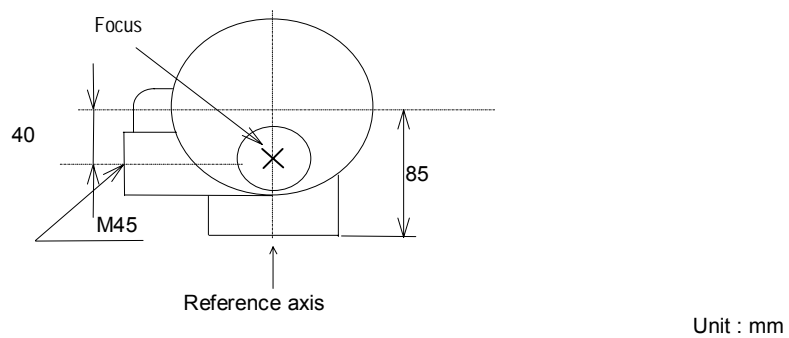


Fig. 6-3 X-ray reference axis and focal spot position (Side view)

6.4 Exposure Condition

MUX-100D/100DJ

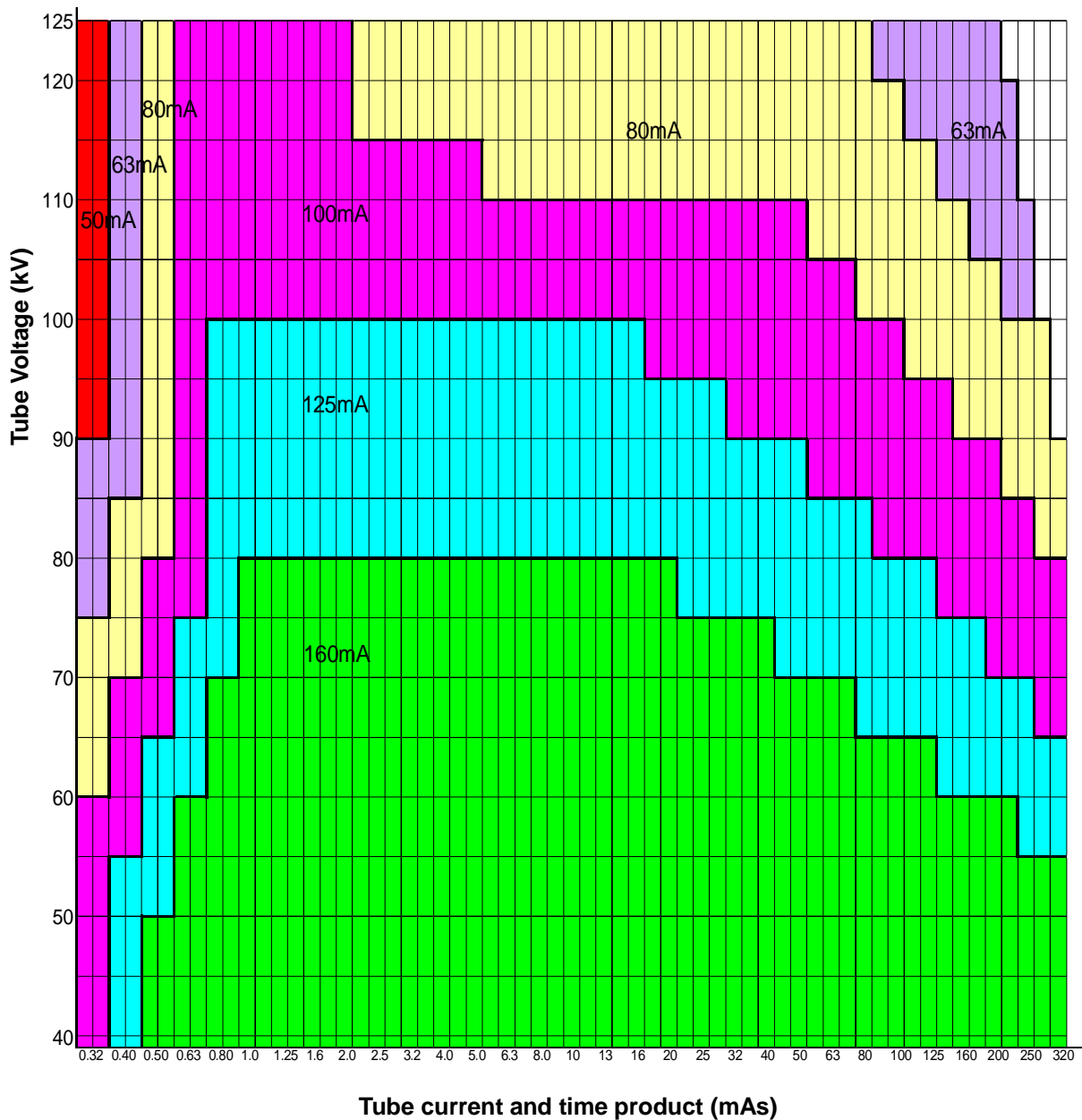


Table Example: Conditions that can be set up at 90kV

At 90kV, a setup of a maximum of 320 mAs is possible.

Since the tube current at 90kV and 100mAs is 100mA, time is 1.0sec.

A setup of 125mA of tube current is possible to take an exposure with 0.8-50mAs.

The time at 90kV and 25mAs is 0.2sec.

MUX-100D/100DJ (at low level battery)

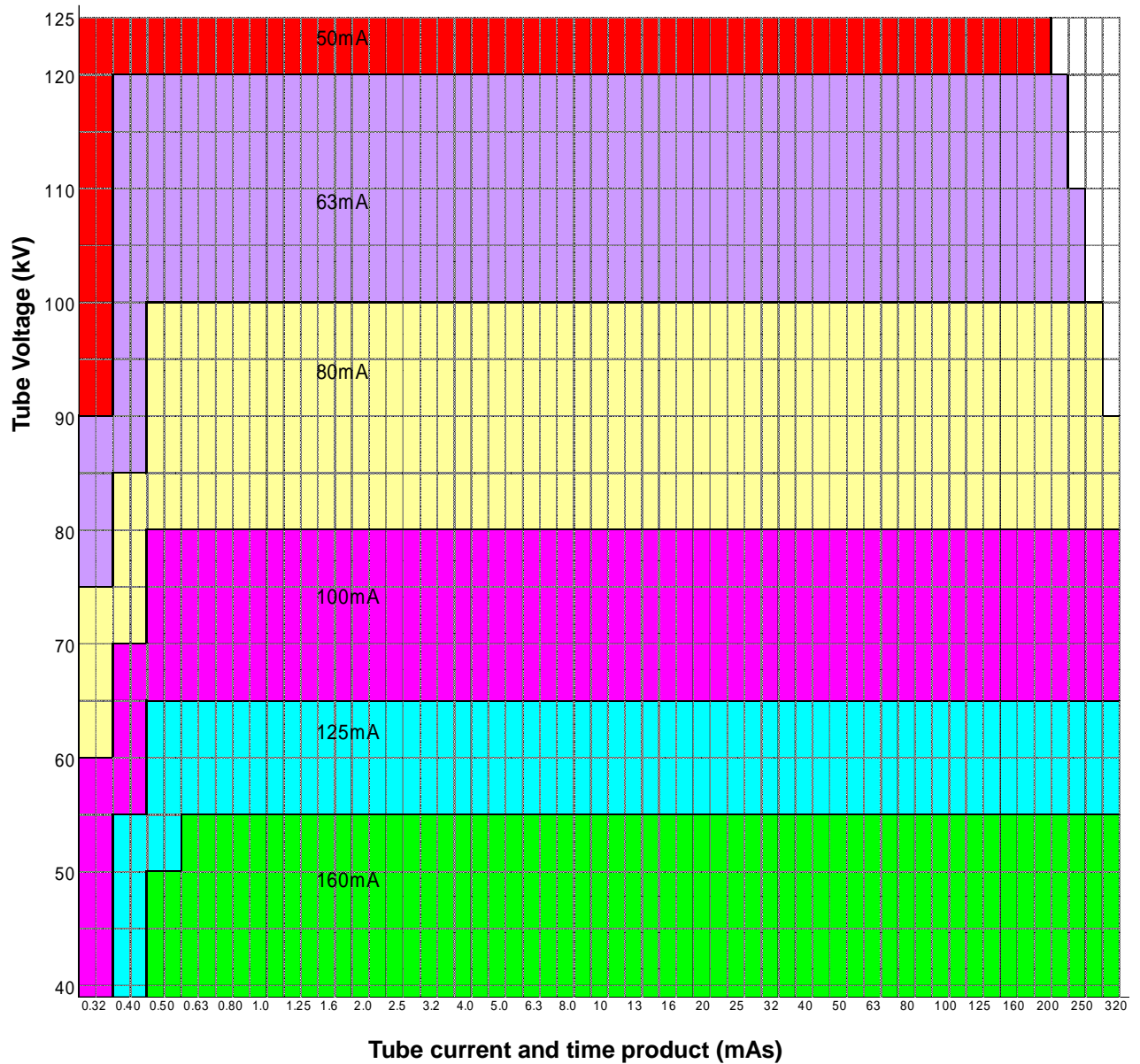


Table Example: Conditions that can be set up at 90kV.

At 90kV, a setup of a maximum of 320 mAs is possible.

Since the tube current at 90kV and 100mAs is 80mA, time is 1.25sec.

When a setup of 125mA of tube current is possible to take an exposure with tube voltage is lowered to 65kV. mAs is 0.5-200mAs.

The time at 65kV and 25mAs is 0.2sec.

No Text

Appendix A



NEXSC DIP SWITCH SETTINGS

DIP switch settings on the NEXSC board are described in this Chapter.

Chapter Contents

A.1 Table of NEXSC DIP SWITCH SETTINGS

A.1 Table of NEXSC DIP SWITCH SETTINGS

The DIP switch function of NEXSC is shown in Table 1.

Table. 1 NEXSC DIP SWITCH SETTINGS

Number	Function	Status: Function	Default
SW2-1	RESERVED	Normally ON	ON
SW2-2	RESERVED	Normally ON	ON
SW2-3	RESERVED	Normally OFF	OFF
SW2-4	RESERVED	Normally OFF	OFF
SW2-5	Measured value display mode	ON: Measured value display mode, OFF: Normal mode	OFF
SW2-6	RESERVED	Normally OFF	OFF
SW2-7	RESERVED	Normally OFF	OFF
SW2-8	Initial setting mode	ON: Initial setting mode, OFF: Normal mode	OFF
SW3-1	EEPROM Initialization	ON: Initialization, OFF: Normal mode	OFF
SW3-2	RESERVED	Normally OFF	OFF
SW3-3	RESERVED	Normally ON	ON
SW3-4	Remote controller option	ON: Option enable, OFF: Option disable	OFF
SW3-5	RESERVED	Normally OFF	OFF
SW3-6	RESERVED	Normally ON	ON
SW3-7	RESERVED	Normally OFF	OFF
SW3-8	Adjustment mode	ON: Adjustment mode, OFF: Normal mode	OFF

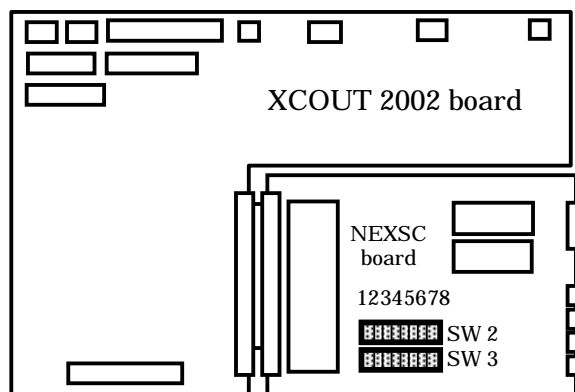
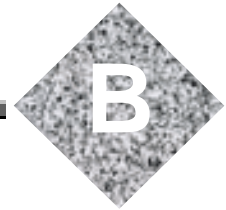


Fig. 1 Layout of the DIP switches on NEXSC board.

Appendix B



Adjustment Mode

Chapter Contents

- B.1 How to Get Into Adjustment Mode
- B.2 Adjustment Mode List
- B.3 Adjustment of Tube Current
- B.4 Adjustment of the Handle
- B.5 Adjustment of the Battery Detection Circuit
- B.6 Setting Date and Time
- B.7 Display and Reset of Exposure Counter
- B.8 Display and Reset of Cumulated Mileage
- B.9 Display and Reset of Error Log
- B.10 Display and Reset of Battery Charge Counter
- B.11 Display Running Speed
- B.12 Battery Voltage Drop Check Mode

B.1 How to Get Into Adjustment Mode

Turn on the DIP switch SW3-8 on NEXSC CPU board first, and then turn on power for the unit. After just turning on power for the unit, confirm "TEC" is displayed on the X-ray control panel.



Fig. 1 Initialize display on adjustment mode

When the program register key is pushed, it is displayed on the panel as shown in Fig. 2 as "Record" when each setting of the explanation in this Chapter.











Fig. 2 Display when registering









B.2 Adjustment Mode List

Mode list in adjustment mode is shown as follows. To switch the page 1 and page 2, Normal key or Obese key is pushed. Press the Normal key for page 1 and the Obese key for page 2.

Adjustment mode Page 1 (Blinking Normal key)

Key	Name of mode	Reference
	Tube current two-point adjustment mode	Refer to B.3
	Tube current each-point adjustment mode	Refer to B.3
	Not used	Not used
	Battery voltage drop check mode	Use this mode to check the condition of the battery when imaging is operated and load is applied. Refer to B.12.
	Adjustment mode of the battery (+)detection circuit	Refer to B.5
	Adjustment mode of the battery (-) detection circuit	Refer to B.5
	Adjustment mode of the Handle	Refer to B.4
	Setting Date and Time	Refer to B.6

Adjustment mode Page 2 (Blinking Obese key)

Key	Name of mode	Reference
	Exposure Counter mode	Refer to B.7
	Cumulated Mileage mode	Refer to B.8
	Error Log mode	Refer to B.9
	Battery Charge Counter mode	Refer to B.10
	Battery charging test mode	Refer to C.6
	Speed meter test mode	Refer to B.11
	Not used	
	Not used	

B.3 Adjustment of Tube Current

Tube current adjustment mode

The tube current of this unit is adjusted by changing the setting of the filament current (called FVR value).

There are five points of adjustable FVR values; 40, 60, 80, 100, 125 kV for tube current positions of 50, 63, 80, 100, 125, 160 mA as shown in the table below. FVR values between tube voltage points are calculated by linear interpolation.

	50 mA	63 mA	80 mA	100 mA	125 mA	160 mA
125 kV					-	-
100 kV						-
80 kV						
60 kV						
40 kV						

: Adjustment point in tube current each-point adjustment mode

: Adjustment point in tube current two-point adjustment mode

There are two tube current adjustment modes. Normally, the tube current is adjusted in (1): tube current two-point adjustment mode. When necessary, the tube current at each adjustment point is checked and adjusted in (2) Tube current each-point adjustment mode

(1) Tube current two-point adjustment mode

FVR value is adjusted at two points 80 kV, 50 mA and 80 kV, 160 mA, and based on the results, the FVR values at all the other points are corrected.

(2) Tube current each-point adjustment mode

FVR value is adjusted at each adjustment point.

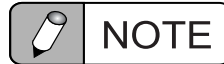


If inappropriate data are contained in the FVR value table, it is not possible to obtain appropriate results by executing the tube current two-point adjustment. If there is a possibility that inappropriate data may be contained in the FVR value table, execute the tube current two-point adjustment after initializing all the FVR values.

Initializing FVR values

Procedures of initializing FVR values

To initialize FVR values, hold down the thin body selection key for body thickness correction until a character string “c A n c e L” appears on the display (for about 3 seconds).



Although it is possible to initialize FVR values with the initialization of NEXSC board, the other important data are also initialized at the same time.

Others

Others

- (1) When the tube current two-point or each-point adjustment mode is selected, the tube current feedback circuit is automatically disabled.
- (2) For adjusting tube current, use a neutral point tube ammeter or the measured value display mode of the unit (turn ON the DIP switch SW2-5 on NEXSC board).

Adjustment in tube current two-point adjustment mode

Procedures of adjusting FVR value

1. Set tube current two-point adjustment mode.
Set the DIP switch NEXSC SW-3-8 to ON and turn ON power.
Then, press the APR head exposure key to enter the tube current two-point mode.
(LEDs of the head exposure key, the regular position exposure key, and the normal body exposure key blink.)
2. Set the tube voltage and tube current
It is not necessary to set the tube voltage, because it is fixed to 80 kV.
The tube current can be set to only two points 50 mA and 160 mA. Set it to 50 mA at first.

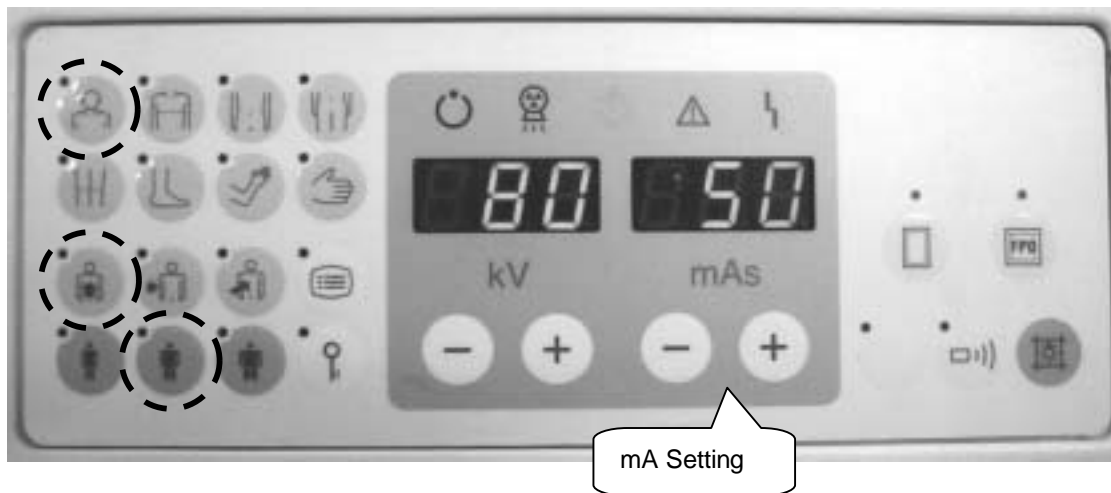


Fig. 3 Tube current two-point adjustment mode: tube current setting
(this figure shows an example of the display: the tube current is set to 50 mA)

3. Execute X-ray exposure
Execute an exposure by pressing the hand switch.

4. Adjusting FVR value

Pressing the remote controller choosing key reveals FVR value on the set tube voltage display. (When FVR value is displayed, the lamp of the remote controller choosing key blinks.) To change the FVR value, press the set tube voltage change key. When decreasing the tube current, set the FVR value to a smaller value, and when increasing the tube current, set it to a larger value. Repeat the steps 3 and 4 until the measured tube current value becomes an appropriate value.

(Recommended range : 45 ~ 48mA)

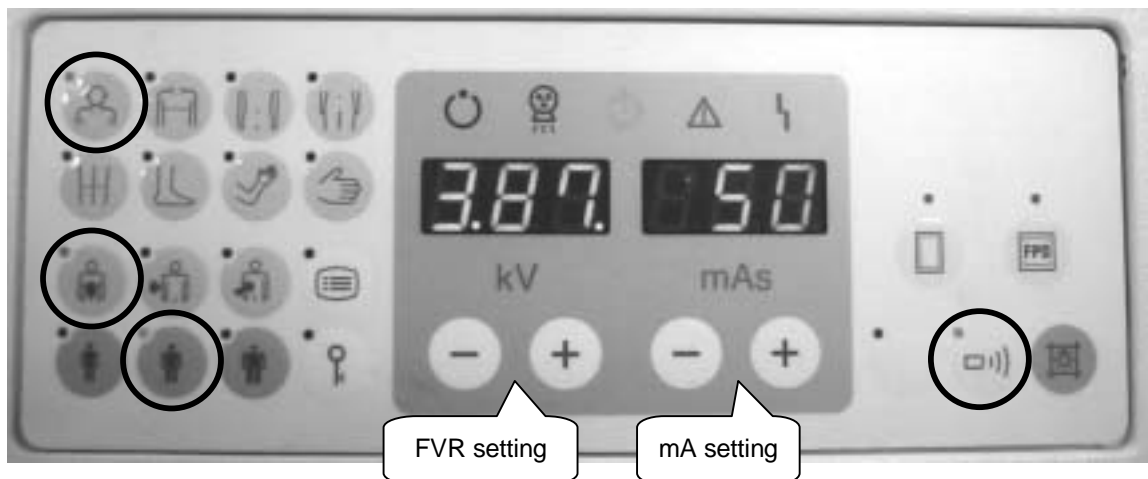


Fig. 4 Tube current two-point adjustment mode: FVR value setting
(this figure shows an example of the display: the FVR is adjusted to FVR = 3.87)

5. Registering FVR values

Register the FVR value when the tube current has become an appropriate value. To register FVR value, press the program registration key. Then, a character string "r e c o r d" is shown on the display.



Moving to another point or mode, or turning off power without pressing the program registration key after changing FVR value would cancel the change of the FVR value. Further, it is possible to register FVR value when exposure condition is displayed (FVR value is not displayed).

6. Set the tube current to 160 mA, and then repeat the steps 3 to 5. (Recommended range of measured tube current : 148 ~ 155mA)



It is possible to set the tube current to either 50 mA or 160 mA first. If this adjustment mode is finished after the FVR value for only one of the two points is registered, the same FVR value is registered for the other point.

Tube current each point adjustment mode

Procedures of adjusting FVR value

1. Set tube current each-point adjustment mode
Set the DIP switch NEXSC SW3-8 to ON and turn ON power. Then, press the APR chest exposure key to enter the tube current each-point adjustment mode. (LEDs of the chest exposure key, the regular position exposure key, and the normal body exposure key blink.)
2. Setting tube voltage and tube current

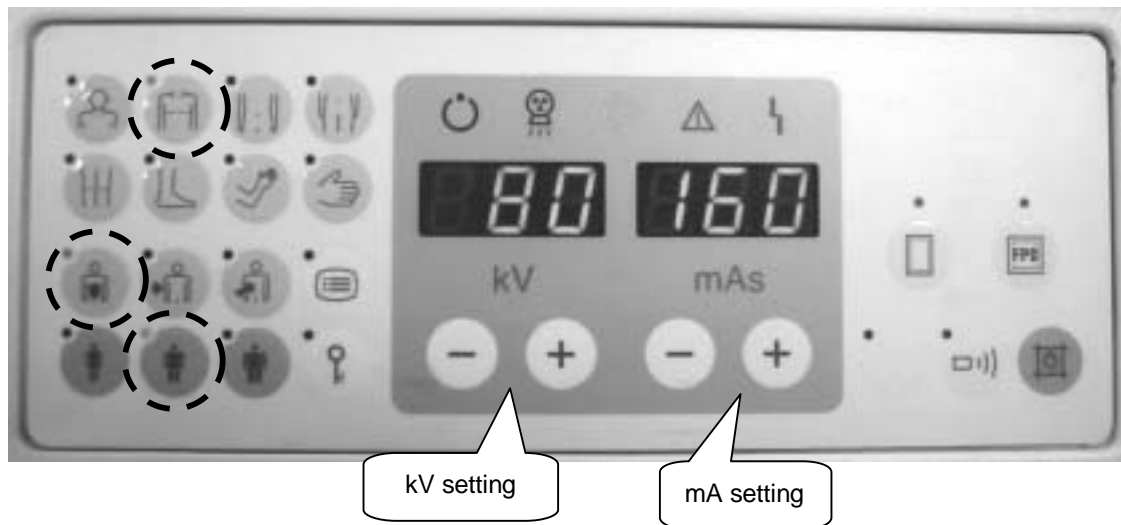


Fig. 5 Tube current each point adjustment mode – Exposure condition setting(In case of 160mA)

3. Exposing X-RAY
Make an exposure by pressing the hand switch.

4. Adjusting FVR value

Pressing the remote controller choosing key reveals FVR value on the set tube voltage display. (When FVR value is displayed, the lamp of the remote controller choosing key blinks.) To change the FVR value, press the set tube voltage change key. When decreasing the tube current, set the FVR value to a smaller value, and when increasing the tube current, set it to a larger value. Repeat the steps 3 and 4 until the measured tube current value becomes an appropriate value.

(Allowable error : within $-15\% \sim +5\%$)

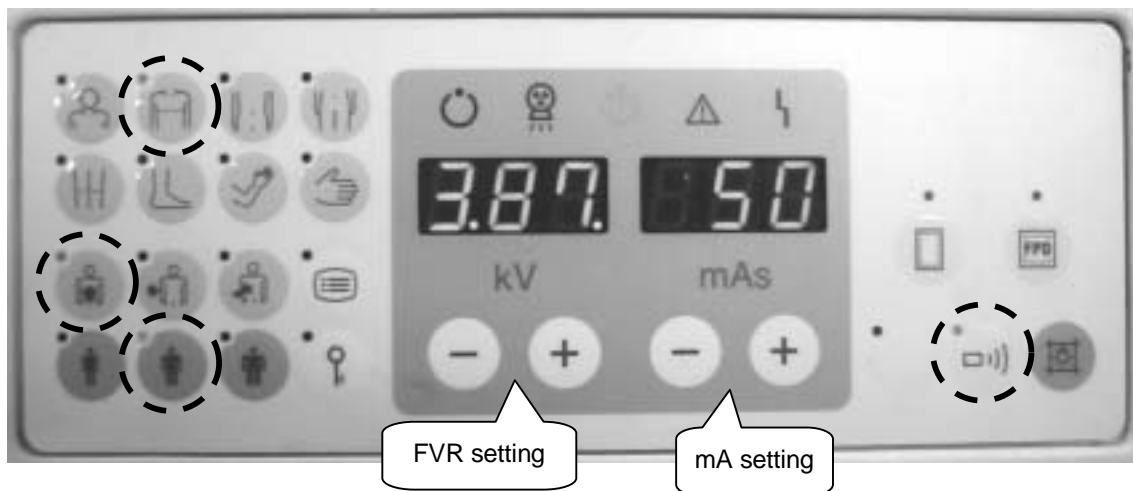


Fig. 6 Tube current each point adjustment mode: FVR value adjusted
(this figure shows an example of the display: the FVR is setting to FVR = 3.87)

5. Registering FVR values

Register the FVR value when the tube current has become an appropriate value. To register FVR value, press the program registration key. Then, a character string "r e c o r d" is shown on the display.



Moving to another point or mode, or turning off power without pressing the program registration key after changing FVR value would cancel the change of the FVR value. Further, it is possible to register FVR value when exposure condition is displayed (FVR value is not displayed).

6. Repeat the steps 3 to 5 for other points, as required.

B.4 Adjustment of the Handle

This is the mode in which handling of the unit during running is adjusted. When the handle or MU Driver board was exchanged, adjust the handle in the following steps:

Procedures of adjusting the handle

1. Setting handle adjustment mode

Set DIP switch NEXSC SW3-8 ON, and turn ON power. Then, enter the handle adjustment mode by pressing the Arm key of APR. (The LED of the Arm key flashes.)

2. Setting a spring gauge

As the adjustment position number is indicated on the tube voltage display, apply the force in the indicated direction with a spring gauge referring to Table 1 and Fig. 8. Tie a piece of string or the like round the end of the handle, then hook the spring gauge to the string, and apply the force.



Position setting

Fig. 7 Adjustment of the Handle

3. Registering the adjustment values (8 position)

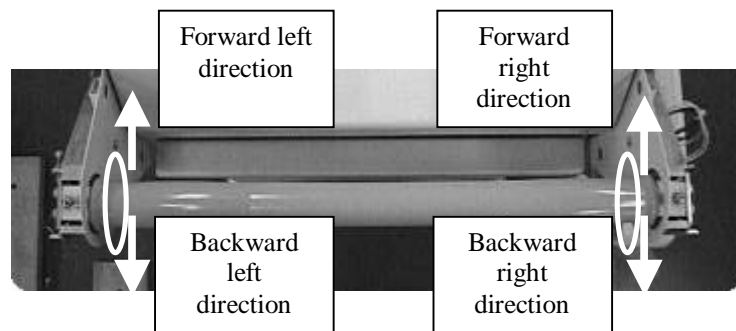
Press the program registration key. Then, the adjustment position number advances to the next. Repeat the steps 2 and 3 about all the adjustment positions shown in Table. 1.



If power is turned off without pressing the program registration ray, the handle adjustment values would not be registered.

Table. 1 Relation between handle adjustment position number and pull power

Adjustment position number	Direction (pull power) by spring gauge
1	Forward left direction (1 kg)
2	Forward left direction (2 kg)
3	Backward left direction (1 kg)
4	Backward left direction (2 kg)
5	Forward right direction (1 kg)
6	Forward right direction (2 kg)
7	Backward right direction (1 kg)
8	Backward right direction (2 kg)

**Fig. 8 Positions and directions for setting the spring gauge**

B.5 Adjustment of the Battery Voltage Detection Circuit

This adjustment is made to equalize the variability among different battery voltage detection circuits. When exchanging MUXPOWER board, MUXCHARGE board, or XCONT board, be sure to make this adjustment in the following steps.

Procedures of battery detection circuit

1. Set DIP switch NEXSC SW3-8 ON, and then apply power to the unit.
The present mode is turns to positive voltage mode by pressing the “Leg” key, and is turns to negative voltage mode by pressing the “Foot” key. The detected battery voltage is displayed by six digits.

2. Press “mAs +”, “mAs -“ key while measuring the actual voltage of batteries, and Press the “Program key” if the difference between the measurement value and the indicated value becomes within $\pm 0.2V$.

The actual voltage of batteries on + side can be measured between "TER3"- "TER5" of the MUXPOWER board.

The actual voltage of batteries on - side can be measured between "TER5"- "TER4" of the MUXPOWER board.

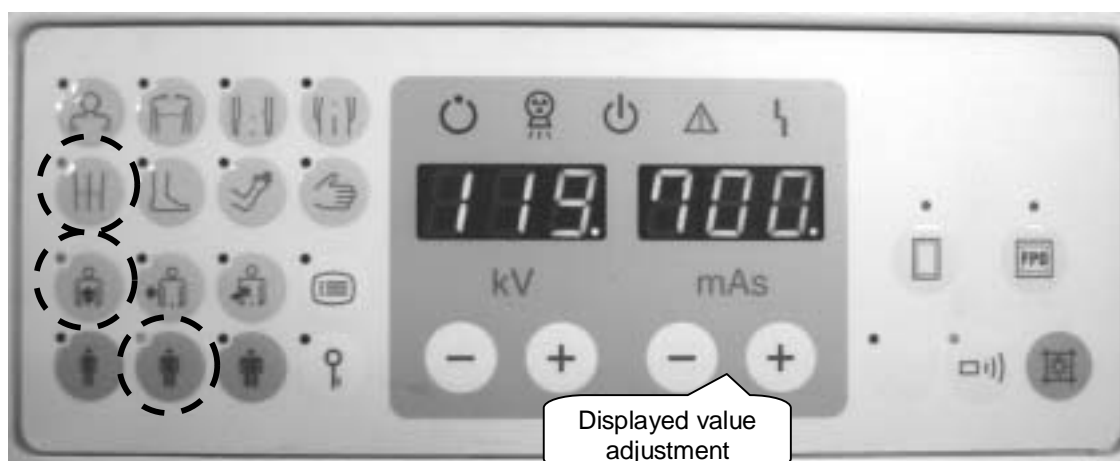


Fig. 9 Adjustment of the battery voltage detection circuit –Positive voltage (in case of 119.7V)

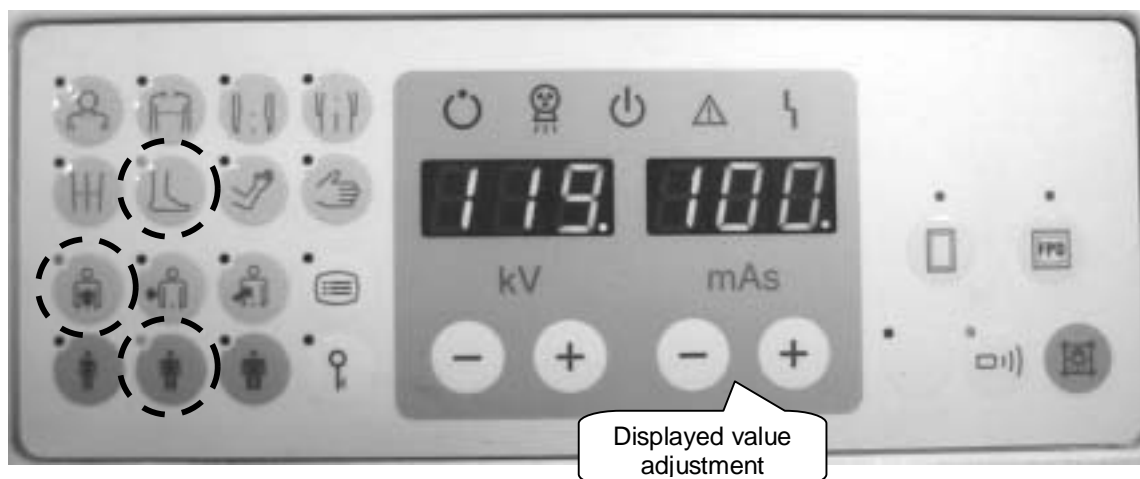


Fig. 10 Adjustment of the battery voltage detection circuit –Negative voltage (in case of 119.1V)

B.6 Setting Date and Time

Year, month, day and time can be set.

Procedures of displaying and resetting date and time:

1. Setting date and time setting mode

Set DIP switch NEXSC SW3-8 ON and turn on power. Then, enter the date and time setting mode by pressing the hand exposure key of APR. (The LED of the hand exposure key blinks.)

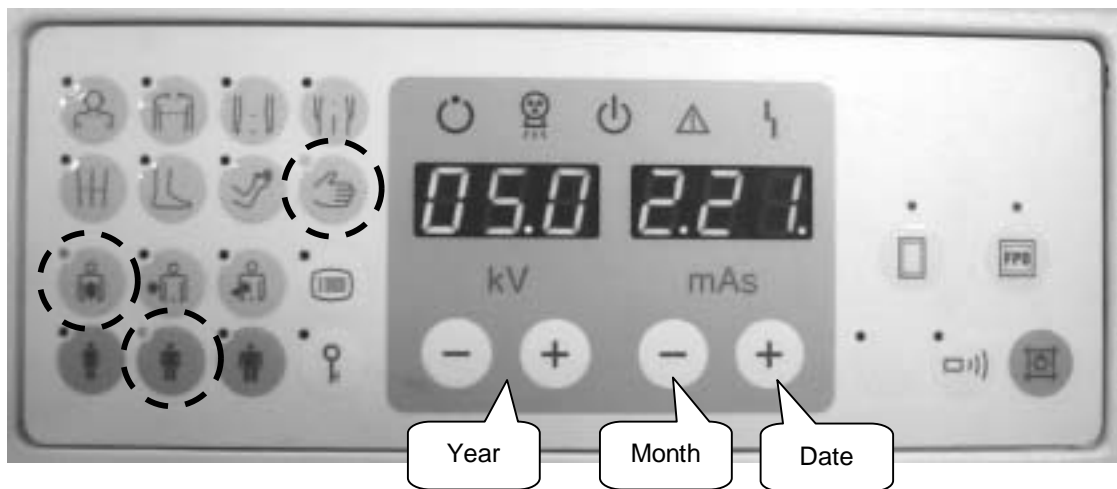


Fig. 11 Setting Date (In case of February 21, 2005)

2. Checking change of date

Reveal the year/month/day display by pressing the remote control selection key. (Turn off the LED of the key.)

Change year with the set tube voltage change keys (+) and (-). (Set the lower two digits of the year.)

Change month with the (-) key for changing set value of the product of tube current and its flow time.

Change day with the (+) key for changing set value of the product of tube current and its flow time.

3. Changing time

Reveal the time display by pressing the remote control selection key.
(The LED of the key flashes.)

Change hour with the set tube voltage change keys (+) and (-) (24-hour display)

Change minute with the (+) and (-) key for changing set value of the product of tube current and its flow time.

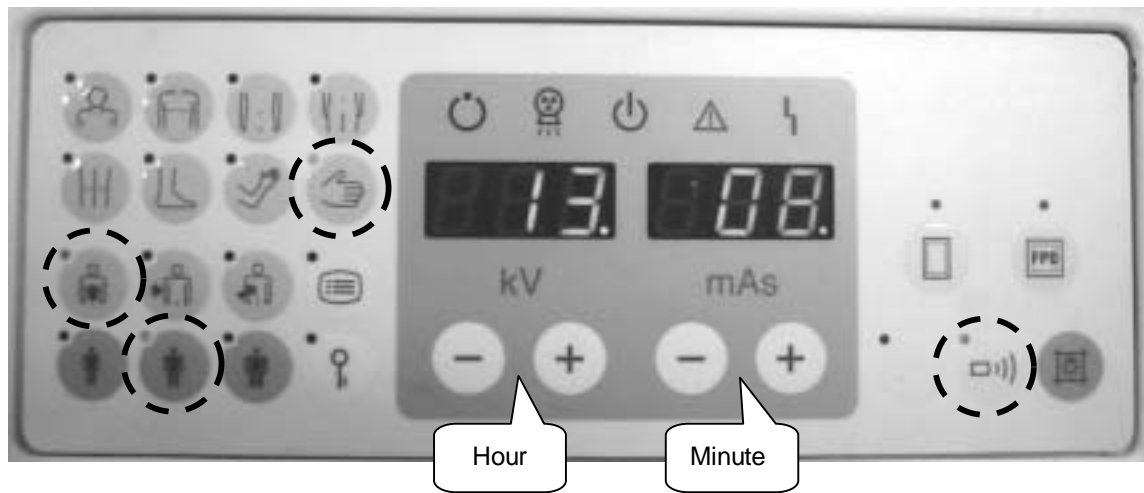


Fig. 12 Setting Time (In case of PM 1:08)

B.7 Display and Reset of Exposure Counter

It is possible to display and reset the number of X-ray exposures that is controlled by software.

Procedures of displaying the number of X-ray exposures:

1. Setting exposure counter mode

Set DIP switch NEXSC SW3-8 ON and turn on power. Then, enter the exposure counter display mode by pressing the Head exposure key of APR. (The LED of the Head exposure key blinks.)

2. Checking the cumulative number of exposures

The cumulative number of exposures appears on the set tube voltage display and the display for the product of tube current and its flow time.

A max. number of cumulative number of exposures is 999999 times. Over the counter's max. number then, the cumulative number of exposures is reset, and the display is turned to "0".



Fig. 13 Display of Exposure Counter (In case of 437 times)

Procedures of displaying the number of X-ray exposures:

1. Resetting cumulative number of exposures

Press the program registration key for about 3 seconds. Then, the cumulative number of exposures is reset, and the display is turned to "0".

***B.8* Display and Reset of Cumulated Mileage.**

It is possible to display and reset the cumulated mileage that is controlled by software.

■ Procedures of displaying and resetting the cumulated mileage:

***1.* Setting cumulated mileage display mode**

Set DIP switch NEXSC SW3-8 ON and turn on power. Then, enter the cumulative mileage display mode by pressing the Chest key of APR. (The LED of the Chest key blinks.)

***2.* Checking cumulative mileage**

The total cumulative mileage appears on the set tube voltage display, and the relative cumulative mileage appears on the display for the product of tube current and its flow time. The total cumulated mileage is the cumulative mileage since the unit was shipped from the factory. The relative cumulative mileage is the cumulative mileage after the last reset of the mileage.

A max. number of cumulative mileage is 999999 km. Over the counter's max. number then, the cumulative mileage is reset, and the display is turned to "0".

***3.* Resetting relative cumulative mileage**

Press the program registration key for about 3 seconds. Then, the relative cumulative mileage is reset and the display is turned to "0".



Fig. 14 Display of Relative Cumulated Mileage (In case of 16km)



Fig. 15 Display of Total Cumulated Mileage (In case of 16km)

B.9 Display and Reset of Error Log

Error code of 32 batches in the past is displayed. If a total of 32 errors have occurred and further a new error occurs, the oldest error data is deleted and the new error data is overwritten.

Procedures of displaying the error log:

1. Setting error log mode

Set DIP switch NEXSC 3-8 ON and apply power to the unit. Then, press the Obese key and the APR [Abdomen](#) Exposure" key to start the Error Log mode. (LED of the [Abdomen](#) Exposure key and Obese key blink.)

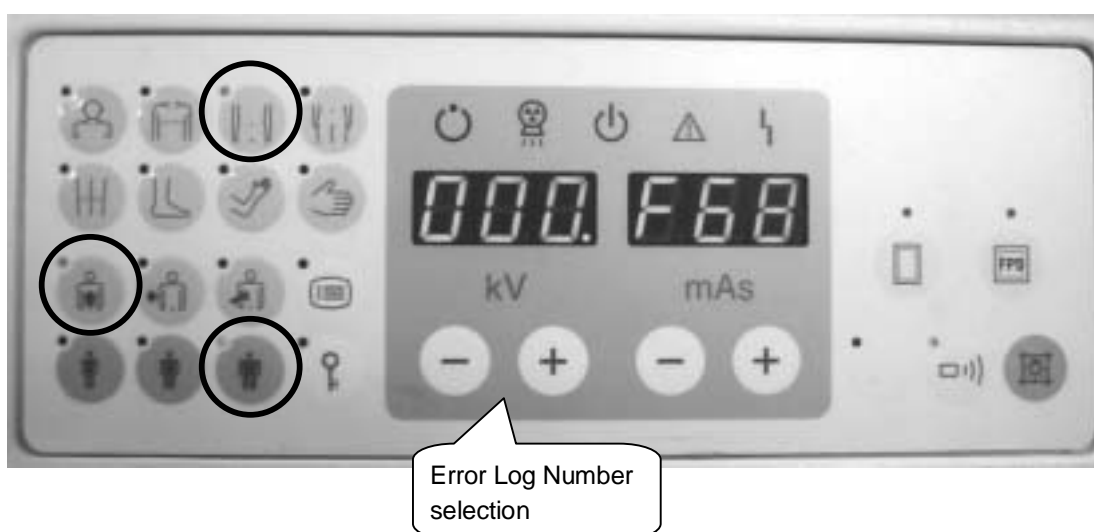


Fig. 16 Display of Error Log (In case of eighth error code was F68)

2. Check error codes

Error code is displayed on mAs indicator and log number is displayed on kV indicator. The number "000" means the latest error and the number "031" means the oldest error. Log number is increased by pressing the kV+ key and decreased by pressing the kV- key.

3. Check error codes date and time

Reveal the date and time display by pressing the remote control selection key.

Procedure of reset for the error log

1. Resetting the error log.

Press the program registration key for about 3 seconds. Then, the error log is reset .

B.10 Display and Reset of Battery Charge Counter

It is possible to display and reset the number of charging times counted by the software.

Procedures of displaying the Battery charge counter

1. Set the charging counter mode.

Set the DIP switch NEXSC SW3-8 to ON and turn ON power. Then, enter the charging counter display mode by pressing the obese body key and APR waist exposure key. (LEDs of the waist exposure key and the obese body key blink.)

2. Check the cumulative number of charging times.

The number of charging times is displayed on the set tube voltage display and the tube current time product display.

The maximum number of the cumulative counter display is 32767. If this number is exceeded, the display is reset to 0.



Fig. 17 An example of the charging counter display (the number of charging times is 176)

Resetting the charging counter

1. Resetting cumulative number of charging times

Press the program registration key for about 3 seconds. Then, the cumulative number of times is reset to "0".

B.11 Displaying Running Speed

A running speed derived from the number of revolutions detected by the encoder is displayed. Use this for checking failure of the encoder or others.

Steps of displaying running speed

1. Set the running speed display mode.

Set the DIP switch NEXSC SW3-8 to ON and turn ON power. Then, enter the running speed display mode by pressing the obese body key and ARR foot exposure key. (LEDs of the foot exposure key and the obese body key blink.)

2. Check the displayed running speed.

A running speed is displayed on the set tube voltage display and the tube current time product display. “ - ” is displayed during going back.



Fig. 18 An example of running speed display (where the speed of both of the wheels is 0 km/hour)

3. Switching between wheel speeds

It is possible to switch the running speed display from one to another of both wheel running speed(km/hour), left wheel running speed(km/hour), and right running speed by pressing the remote control choosing key.



Fig. 19 An example of running speed display (left wheel speed)



Fig. 20 An example of running speed display (right wheel speed)

B.12 Battery Voltage Drop Check Mode

This mode is to check the drop of battery voltage and the inverter operation (VIN) when load is applied for exposure. Use this mode to check the battery condition.

Procedures to display the battery voltage drop check mode

1. Set on the battery voltage drop check mode.

Turn on the DIP switch SW3-8 on the NEXSC board first, and then turn on the power of the unit. Then, press the Normal key and [Waist](#) Exposure key on APR to start the battery voltage drop check mode. (LED of the [Waist](#) Exposure key and Normal key blinks.)



Fig. 21 Example of the display of the battery voltage drop check mode (exposure condition is displayed)

2. Exposure

The exposure condition indicator displays inspection exposure condition (80 kV, 160 mA, 100 msec).

Values are measured when 80 msec pasts after the exposure starts.

Perform exposure by pressing the hand switch. After the exposure, measured tube voltage and tube current are displayed on the exposure condition indicator.

(Measured tube voltage and tube current other than this mode are values measured 20 msec after the exposure starts. Therefore, the values may not match with the tube voltage and tube current measured in this mode.)

3. Switching indicated values

By pressing the remote controller choosing key, exposure condition, battery voltage on the plus side, battery voltage on the minus side, inverter operation frequency voltage during exposure VIN, measured tube voltage, and measured tube current are displayed in sequence.

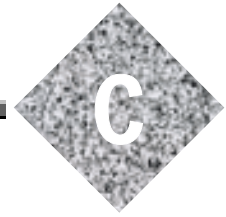
(Battery voltage on the plus side and battery voltage on the minus side are measured 80 msec after the exposure starts in this mode. They do not match with the battery voltage measured by procedures described in B.5 Adjustment of the battery voltage detection circuit.)



At present, conditions of the unit and battery cannot be judged using the values provided in this mode. (Use the values as reference.)

No Text

Appendix C



Adjusting Methods

These adjustments are not required in the usual installation of the unit. If the circuit boards or parts are replaced and readjustment is needed, refer to these adjusting methods.

Chapter Contents

- C.1 Preperation
- C.2 Adjusting MUX CHARGE-04A board
- C.3 Adjusting XCONT-2002 board
- C.4 Adjusting the battery-voltage detection circuit
- C.5 Checking the X-ray exposure
- C.6 Checking battery charging
- C.7 Volume control of a buzzer
- C.8 Finish

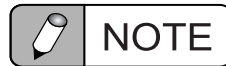
C.1 Preparation

Before making the detailed adjustment in this Section, confirm the following items:

1. The connections of connector P1 and P2 are compliant with the supply voltage. (Refer to 4.4)
2. The settings of DIP SW on NEXSC board are matched with the unit type and the options. (Refer to Appendix A)
3. The setting of DIP SW1-1 on INVERTER UNIT board is matched with the OFF side. (Silk pattern is MUX-100 side.)
4. Move the arm out of parking position. (For displaying and exposing).



turn on the power supply of the unit by connecting the power plug as turning the main breaker off, and turning on breaker NFB1 when the NEXSC board is initialized or is initialized before the device is adjusted.



When the lever is made below , breaker NFB1 is turned on.
When the lever is made up, breaker NFB1 is turned off .

C.2 Adjusting MUX CHARGE-04A board

Preparation

1. Turn VR1, VR2, and VR3 of MUX CHARGE-04A board counterclockwise to the maximum. (It is unnecessary to do this in case that the MUX CHARGE-04A board.)
2. Turn off the Main breaker.
3. Make sure the breaker NFB1 is OFF and connect the power plug.
4. Turn on the DIPswitch SW3-8 (adjustment mode) of NEXSC board.
5. Short-circuit CP3 [CHECK1] and CP4 [CHECK2] of XCONT board with a clip or the like.

Adjusting the MUXCHARGE-04A board

1. Turn ON the breaker NFB1. (Power will be turned ON)
2. Confirming the fundamental frequency of 50 kHz:
Confirm that the waveform at CP14 [50kHz] shows approximately 50 kHz (period: 17 to 23 μ sec).
3. Adjusting the inverter frequency of 120 Hz:
Adjust VR3 [120Hz] so that the waveform at CP16 [120Hz] shows 120 Hz (period: 8.1 to 8.3 msec).
4. Adjusting the pulse width for the starter:
Performing READY operation, adjust VR2 [STARTER] so that the pulse width at High-level of the waveform at CP17 becomes 2.7 msec (± 0.1 msec).
5. Rough adjustment of the pulse width for the collimator lamp:
Lighting the collimator lamp, adjust VR1 [LAMP] so that the pulse width at High-level of the waveform at CP17 becomes 3.8 msec (± 0.1 msec).



The pulse width can be finely adjusted by adjusting VR1 while measuring the voltage at the leads of the collimator lamp so that the voltage becomes an appropriate value. (Refer to Appendix E7)

6. Turn OFF NFB1 (Power will be turned off).

C.3 Adjusting XCONT-2002 board

Preparation

1. Turn VR1, VR2, and VR3 of XCONT-2002 board counterclockwise to the maximum. (It is unnecessary to do this in case that XCONT-2002 board has been already adjusted.)
2. Turn VR4 of XCONT-2002 board to center position. (It is unnecessary to make further adjustment of VR4 in normal case.)
3. Turn off the Main breaker.
4. Make sure the breaker NFB1 is OFF and connect the power plug.
5. Turn on the DIPswitch SW3-8 (adjustment mode) of NEXSC board.
6. Short-circuit CP3 [CHECK1] and CP4 [CHECK2].

Adjusting the inverter control circuit

1. Short-circuit CP [+15V] and CP5 [VSIN].
2. Turn ON the breaker NFB1. (Power will be turned ON)
3. Turn ON the key switch. (This enables Reads and X-ray operations.)



CAUTION

Confirm that main breaker is turned OFF.

4. Adjustment Max frequency of inverter.

Adjust VR2 [VFADJ(kV)] so that the frequency at CP29 [F] becomes 112 kHz (period: 8.9 to 9.0 μ sec).

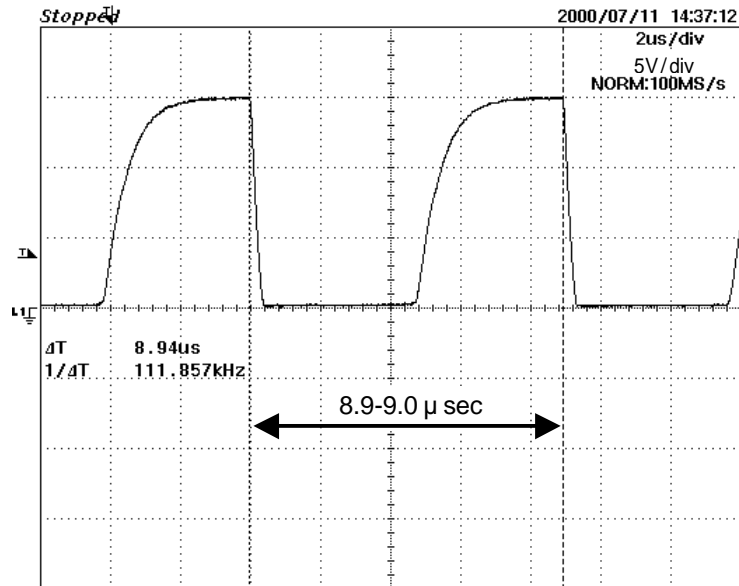


Fig. 1 Wave form at CP29[F]

5. Rough adjustment of the inverter pulse width:

Performing READY and XRAY operations, adjust VR3 [PULSEADJ] so that the pulse width at CP33 [A/D] becomes 7.5 ± 0.1 μ sec. (Be cautious about the polarity.)

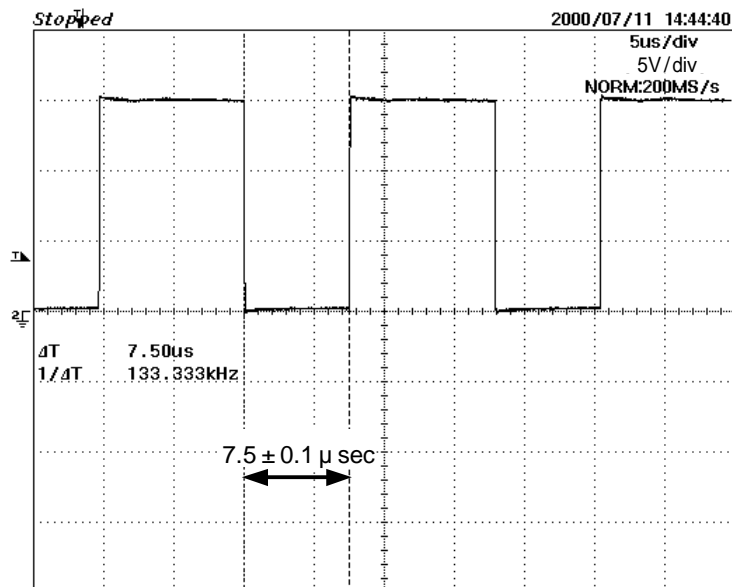


Fig. 2 Wave form at CP33[A/D]

6. Fine adjustment of the inverter pulse width:

Connect oscilloscope probes to CP [Ga] and CP [Ea] and to CP [Gb] and CP [Eb] of INVERTER UNIT board, perform READY and XRAY operations, and check the gate waveform of IGBT. Confirm that the pulse width at +5 V is 7.8 to 8.0 μ sec. Readjust the pulse width if it is necessary (VR3 [PULSEADJ] of Xcont board).

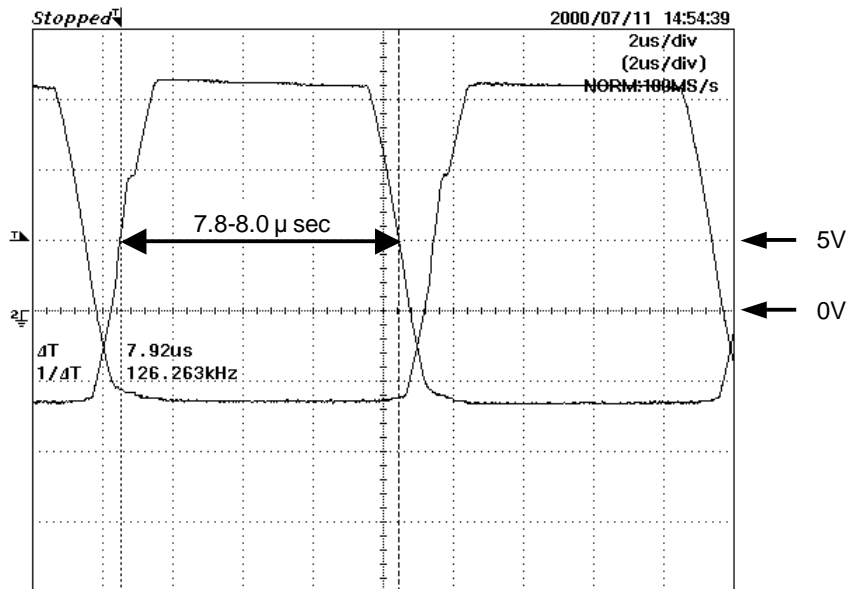


Fig. 3 Waveform between CP[Ga] – CP[Ea], CP[Gb] – CP[Eb] on INVERTER UNIT board

7. Turn OFF the power (turn OFF NFB1), and remove the short-circuit between CP [+15V] and CP5 [VSIN].

Adjusting mAs circuit

1. Short-circuit CP [+5V] and CP30 [mA-IN].
2. Apply power to the unit (turn ON NFB1).
3. Adjust VR1[mAs] so that the relation between the frequency at CP28 [MASCLK] and the voltage at CP 30 is 5 kHz/V. (For example, if the voltage at CP30 is 5.10 V, the frequency at CP28 is 25.5 kHz.)
4. Turn OFF the power (turn OFF NFB1), and remove the short-circuit between CP [+5V] and CP30 [mA-IN].

C.4 Adjusting the battery-voltage detection circuit

Preparation

- 1.* Confirm the power plug has been disconnected.
- 2.* Set the DIPswitch NEXSC SW3-8 (Adjustment mode) ON.
- 3.* Confirm there is no shorting wires between check pin on XCONT board.
- 4.* Turn on the main breaker.
- 5.* Turn the key switch ON. (Power will be turned ON.)

Adjusting the positive-side of battery-voltage detection.

- 1.* Press Leg key (the mode for adjusting the positive-side of battery-voltage detection is entered).
- 2.* Measure the positive-side of actual battery voltage (the voltage between TER3 and TER5 on MUXPOWER board).
- 3.* Press mAs+ and mAs- key so that the same voltage as the actual voltage is obtained. When the same voltage (within ± 0.2 V) is obtained, press the program entry key.

Adjusting the negative-side of battery-voltage detection.

- 1.* Press Foot-key (the mode for adjusting the negative-side of battery-voltage detection is entered).
- 2.* Measure the minus-side of actual battery voltage (the voltage between TER5 and TER4 on MUXPOWER board).
- 3.* Press mAs+ and mAs- key so that the same voltage as the actual voltage is obtained. When the same voltage (within ± 0.2 V) is obtained, press the program entry key.
- 4.* After the adjustments have finished, turn OFF the power (turn OFF key switch).

C.5 Checking the X-ray exposure

Preparation

1. Confirm the power plug has been disconnected.
2. Set the DIPswitch SW3-8 on the NEXSC board ON. (Adjustment mode)
3. Set the DIPswitch SW2-5 on the NEXSC board ON. (Measurement display mode)
4. Confirm there are no short-wire between check pins on the XCONT board.
5. Turn the main breaker ON.

Confirmation of ready operation

1. Turn ON the key switch.
2. Confirm that the collimator lamp comes on by performing the collimator lamp lighting operation.
3. Performing READY operation, confirm that the anode of X-ray tube is rotating and the exposure-ready lamp comes on within approximately 3 seconds.
4. During READY operation, check the waveform of filament heating voltage between CP2 [CO] and CP1 [CL] on INVERTER UNIT board.

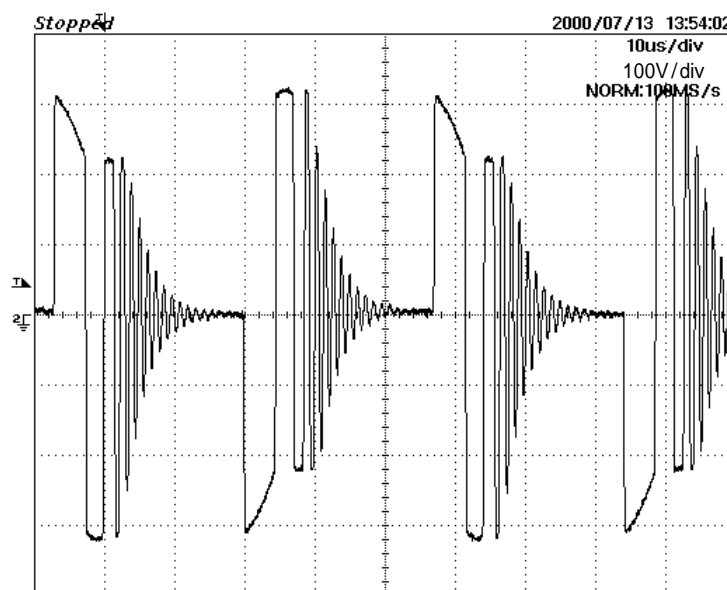


Fig. 4 Waveform between CP1[CL] – CP2[C0] on the INVERTER UNIT board

Confirmation of X-ray exposure

1. Press the “Head” key on the adjustment mode.
2. Adjust on 2 points at 80kV,50mA, and 160mA. As the measurement display is within the following range. At the same time, confirm the waveform of tube voltage (CP9[TKV] which is on the XCONT board)

80kV,50mA : 45 ~ 48mA

80kV,160mA : 148 ~ 155mA

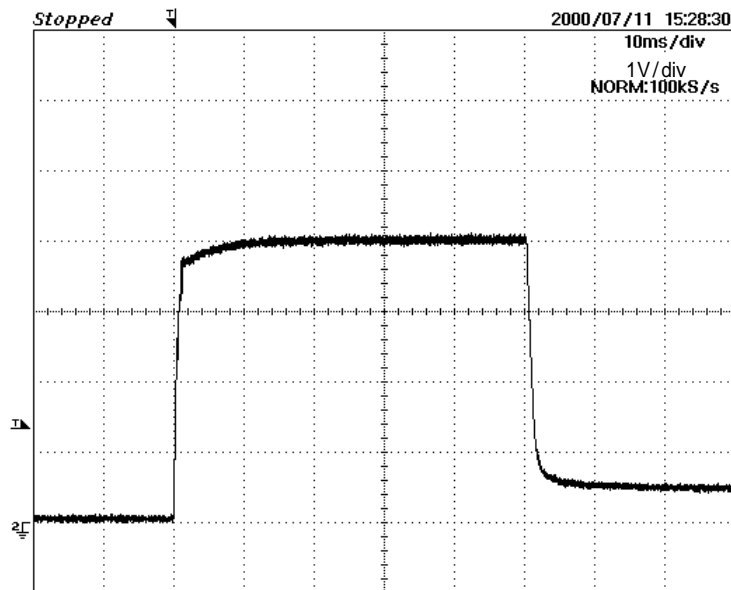


Fig. 5 Waveform at the CP9[TKV] (In case of 80kV,160mA)

3. If necessary, press the “Chest” key, get into the tube current each-point adjustment mode and then check that measurement value is with error within -15 - +5 % range of the setting value.



NOTE

Use the tube anmeter of neutral point current measureing type. The tube anmeter of measuring of high voltage side may indicate the tube current value with large error.


Connect the tube ammeter of neutral point current measuring type to mA+ and mA- of terminal board X2 on XCONT board. For the measurements, remove the short-circuit plate.

C.6 Checking battery charging

Preparation

1. After it is confirmed that breaker NFB1 is turning off, connect the power plug.
2. Turn the key switch OFF.
Make sure that the DR system has stopped.
3. Turn the main breaker ON.
4. Set the DIP switch SW3-8 on the NEXSC board (Adjustment mode) ON.
5. Confirm there are no short-wire between check pins on the XCONT board.

Procedure of confirming for battery charge

1. Turn the breaker NFB1 ON. (Power will be turned ON.)
2. Press Obese-key to move to the adjustment mode Page 2.
3. Press Leg-key (after about 10 seconds, the battery is charged for about one minute).
4. Confirm that the waveform of the voltage between CP18 (D2 cathode incase of BOARD ) and GND on MUX CHARGE-04A board is approximately as shown in the Figure below. (Fig. 6 waveform is in case of main supply frequency 60Hz. If main supply frequency is 50Hz, period between pulses is 10ms.)
5. Then unplug the unit.

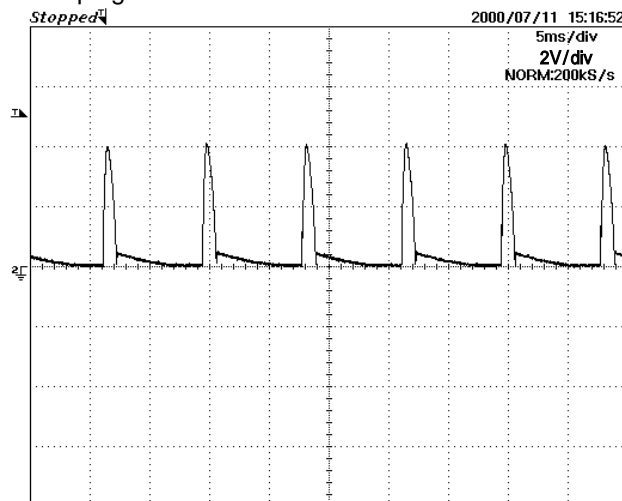


Fig. 6 Waveform between CP18 – GND

C.7 Volume control of a buzzer

The volume control procedure of a loud buzzer

From the hole of a catch part cover, volume for volume control can be turned and the volume control of the amount buzzer of loud sounds can be performed. Volume is large or small please adjusts buzzer volume



When a buzzer setup in setting change mode is except "ON", the amount buzzer of loud sounds does not sound at the time of X-ray exposure. When a buzzer setup is "ON", please perform subsequent adjustments (when it is a setup to which the amount buzzer of loud sounds sounds at the time of X-ray exposure).

1. It goes into setting change mode.
(Please refer to the change method of handling description 4.8 various setup.)
If DIPSW 2-8 or 3-8 is turned "on ", it will not put into setting change mode. Please check a setup of DIPSW.A buzzer setup is started. A setup of a buzzer is turned "ON"
(Setup to which the amount buzzer of loud sounds at the time of X-ray exposure).
2. If it continues pushing the collimator lamp key of a sheet panel Approx. 1 second or more, the amount buzzer of loud sounds will sound.
3. Please fit a precision driver (-) over the hole of the cover upper left end of a catch part, turn volume, and adjust the volume of the amount buzzer of loud sounds.

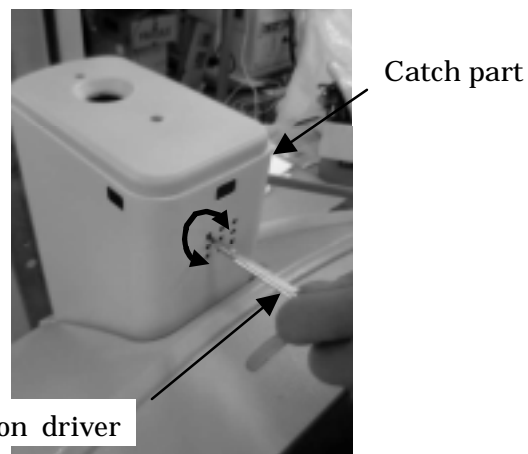


Fig. 7 The position of adjustment volume

4. If adjustment of volume is completed, please push the collimator lamp key of a sheet panel. The amount buzzer of loud sounds stop.

Please end setting change mode.

The volume control procedure of a sheet panel buzzer

The buzzer volume control of the sheet panel, which turns volume for volume control of a sheet panel, and sounds at the time of key operation etc., can be performed. volume is large or small, please adjust buzzer volume.

1. Remove Upper cover.
2. Please turn volume VR 1 on the sheet panel board on the back of Upper cover, and adjust the buzzer volume of a sheet panel.

The buzzer volume control of the sheet panel

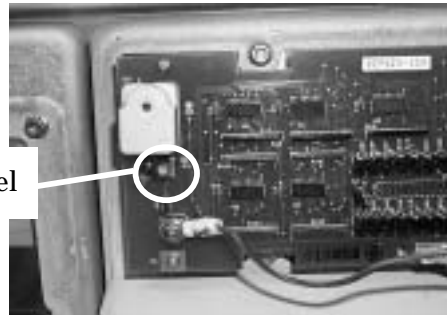


Fig. 8 The position of adjustment volume

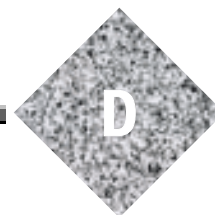
3. Upper cover will be attached if adjustment of volume is completed.

C.8 Finish

Return the DIP SW on NEXSC board to its normal use condition.

No Text

Appendix D



Error Message List

Referring this error message list, quickly resolve problems, if any.

Chapter Contents

D.1 Error Message List

D.1 Error message list

The content of the fault is indicated fault indication lamp **I**, and indicated code on the mAs display.

Table. 1 Fault error message list

Error code	Content of the error
F01	Main supply voltage is more than 20% higher than the standard voltage.
F02	Main supply voltage is more than 30% lower than the standard voltage.
F03	-15V OK signal is not supplied. (A failure in –15V supply.)
F11	X-ray tube voltage during irradiation is detected to be more than 30 kV higher than the set value.
F12	Measured X-ray tube voltage during irradiation is more than 50% lower than the set value.
F13	Measured X-ray tube voltage during irradiation is lower than 10kV.
F14	KVBR signal is supplied. (A glow discharge in X-ray tube, or abnormal high x-ray tube voltage has been detected.)
F21	Measured X-ray tube current during irradiation is more than 50mA larger than the set value.
F22	Measured X-ray tube current during irradiation is more than 50% smaller than the set value.
F23	Measured X-ray tube current during irradiation is smaller than 10mA.
F31	Measured filament current is more than 50% higher than the set value.
F32	Measured filament current is more than 50% lower than the set value.
F33	Measured filament current is lower than 1A.
F51	Battery voltage of plus-side during charging is higher than 155V.
F52	Battery voltage of plus-side during charging is lower than 100V.
F53	Battery voltage of minus-side during charging is higher than 155V.
F54	Battery voltage of minus-side during charging is lower than 100V.
F55	Voltage of plus-side battery is more than 12V higher than that of minus-side battery.
F56	Voltage of minus-side battery is more than 12V higher than that of plus-side battery.
F5a	Signal CHBR1 is supplied. (Charging current is higher than 3.8A.)
F5b	Signal CHBR2 is supplied. (Battery voltage + or - side during charging is higher than 155 V.)
F5c	The power lead had been connected when main breaker is turned off.
F5E	Measured charging current more than 50% larger than the set value for 10 seconds.
F5F	Measured charging current less than 30% of the set value for 10 seconds.

F61	STOK signal is not returned even after the starter drive time is over.
F62	XOK is not returned even after one second has passed since HX1 was supplied.
F6E	Irradiation does not finish by backup time / mAs.
F6F	KVT does not input even after 250 msec has passed since EXR output.


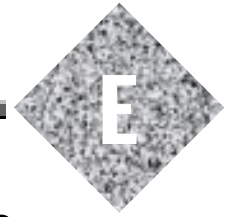
The content of the warning is indicated warning indication lamp , and indicated code on the mAs display approx. 3 sec.

Table. 2 Warning error message list

F64	It is an invalid HX signal input. (EX. Hand switch was pushed at the time of a power on.)
F65	It is an invalid AR signal input. (EX. Hand switch was pushed at the time of a power on.)
F68	The X-ray exposure operation had been done before the ready preparation of the FPD device was completed.
F6d	EMG signal is supplied. (Emergency stop switch has being pressed.)
F76	An illegal value was transmitted from CXDI. (EX. Out of range APR No.)
H1	With the set exposure condition, the heat accumulated on the anode of the X-ray tube is over tolerance.
H2	The heat accumulated on the anode of the X-ray tube has reached its tolerance limit.
H4	THERMAL signal is not supplied.
E	CPU battery voltage has dropped.
EEE	CPU battery is completely empty.
bbb	Main battery voltage has dropped.(Only movement of the system is possible.)
d0	Abnormal motor is detected.
d1	Over-current (motor) is detected.
d2	Abnormal motor is detected.
d3	Abnormal encoder is detected.
d4	Brake release switch is ON at the power on.
d5	Small movement switch (forward) is ON at the power on.
d6	Small movement switch (backward) is ON at the power on.
d7	Drive handle input (left) was detected at the power on.
d8	Drive handle input (right) was detected at the power on.
d9	Bumper switch is ON at the power on.
d10	Arm lock release switch is ON at the power on.
d11	Arm lock release lever is ON at the power on.

No Text

Appendix E



Maintenance and Inspection

Basically, it is not necessary to make the replacement of any parts described in this Chapter during installation of the unit.

Chapter Contents

- E.1 Expendable Parts List
- E.2 Batteries Replacement
- E.3 CPU Backup Battery Replacement
- E.4 Collimator lamp Replacement
- E.5 Maintenance of rotary X-ray tube section
- E.6 Centering the Collimator and X-ray Focus
- E.7 Adjustment of Collimator lamp voltage
- E.8 Cleaning and disinfections
- E.9 Communication with CXDI
- E.10 How to Restriction from Recovery CD

E.1 Expendable Parts List

Expendable Parts are shown as Table. 1. Use specified parts at the part replacement.

Table. 1. Expendable Parts List

Parts Number	Parts Name	Rating
074-71014-01	Battery	*1
503-46520-01	Wire Rope	For MUX-100D
503-46520-03	Wire Rope	For MUX-100DJ
511-37058	Wheel,ZP-W1	
511-37075	Caster,439S-150	
503-49045	Code reel	
511-70147	Code reel (LAN)	
501-78646	CPU backup battery	
062-65003-02	Collimator lamp	
503-34889-02	Earth belt	
036-11143-21	Oring, 4D ss-060	
072-06033-08	Fuse F1 (On INVERTER UNIT-MUX board)	100A, 600V Slow blow
072-01664-34	Fuse F13 (On CONTROL UNIT MUX chassis)	6.3A, 250V Slow blow
072-01664-15	Fuse F11,F12,F23 (On CONTROL UNIT MUX chassis)	0.5A, 250V Slow blow
	Fuse F1 (On MUX CHARGE-04A board)	
	Fuse F6 (On MUX POWER-99 board)	
072-01664-26	Fuse F1,F2(On MUX POWER-99 board)	2.0A, 250V Slow blow
	Fuse F21,F22 (On CONTROL UNIT MUX chassis)	
072-01664-33	Fuse F3,F7,F8 (On MUX POWER-99 board)	5.0A, 250V Slow blow
	Fuse F1 (On MUX CHARGE-04B board)	
072-01659-83	Fuse F4,F5 (On MUX POWER-99 board)	10A, 250V Slow blow
072-01665-34	Fuse F9 (On MUX POWER-99 board)	10A,250V Slow blow
532-23029	Silicon packing (standard plug for the high-voltage unit)	3 mm thick 2 mm thick packing: 532-23061
511-15061-11	Contact pin for replacement (standard plug for the high-voltage unit)	Contact pin + tool
511-15061-13	Mini plug maintenance kit (mini plug for the X-ray tube unit)	Silicon rubber jacket: 5 pcs Silicon washer: 5 pcs Silicon oil: 5 pcs

*1 The parts number 074-71014-01 is for 1piece of battery. 20 pieces are needed when replacing batteries.

E.2 Batteries Replacement

Batteries replacement

Parts Number of the battery is 074-71014-01 (Battery,PX12090). 20 pieces are needed when replacing batteries.



WARNING

When replacing the batteries, make sure to place the unit on the flat floor. Otherwise, the unit may fall down.



WARNING

Do not wear metallic accessories such as the bracelet, hanging jewelrys, and clocks during the battery exchange work. It is very dangerous when coming in contact between terminals of the battery.



WARNING

Pay attention to polarity of +/- when arranging the battery in the battery unit. Do not short-circuit and contact between terminals.



CAUTION

The battery with a different kind, type, manufacture and residual quantity should not exist together. The device will not work properly.

- (1) All 20 batteries should be replaced with new 20 batteries.
- (2) 10 batteries in plus side (Battery ASSY BAT1,BAT2) should be with same date of manufacture.
- (3) 10 batteries in minus side (Battery ASSY BAT3,BAT4) should be with same date of manufacture.
- (4) Difference date of manufacture between plus side 10 batteries and minus side 10 batteries should be less than one month.

Date of manufacture is stamped on top of the battery.

An example of stamp is as follows.

050217## ... Feb.17.2005 (## is alphabet or number which bear no relation to date of manufacture.)

■ Procedure of the battery exchange

1. Turn ON the key switch, and lift the arm up to the position shown in Fig. 1.



Fig. 1 Arm position to replace the battery

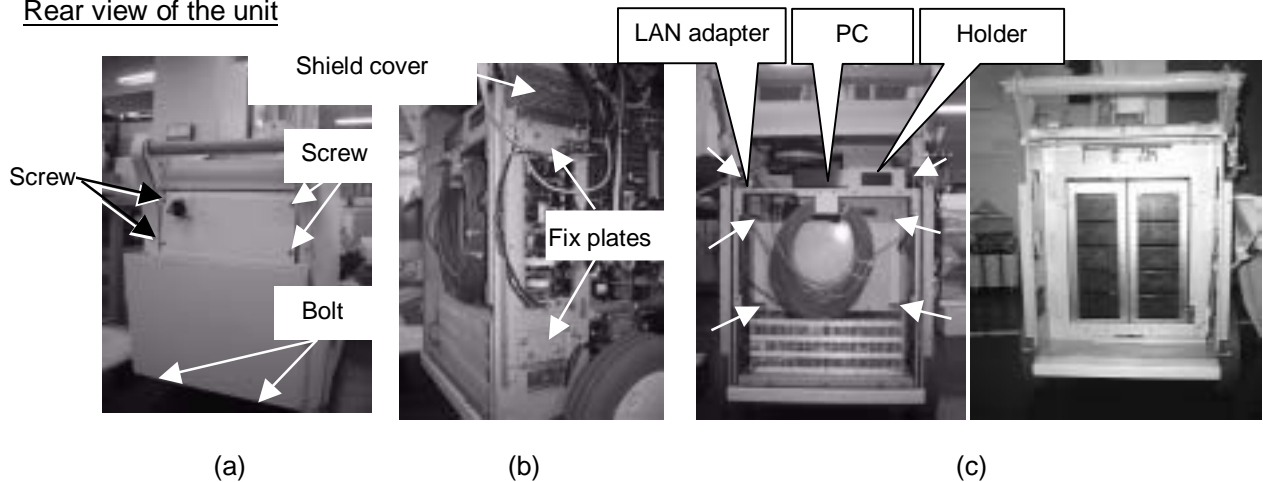


Be sure to start replacing the battery after moving the arm up to the position shown in Fig. 1. Otherwise the unit may topple over when battery is replaced.

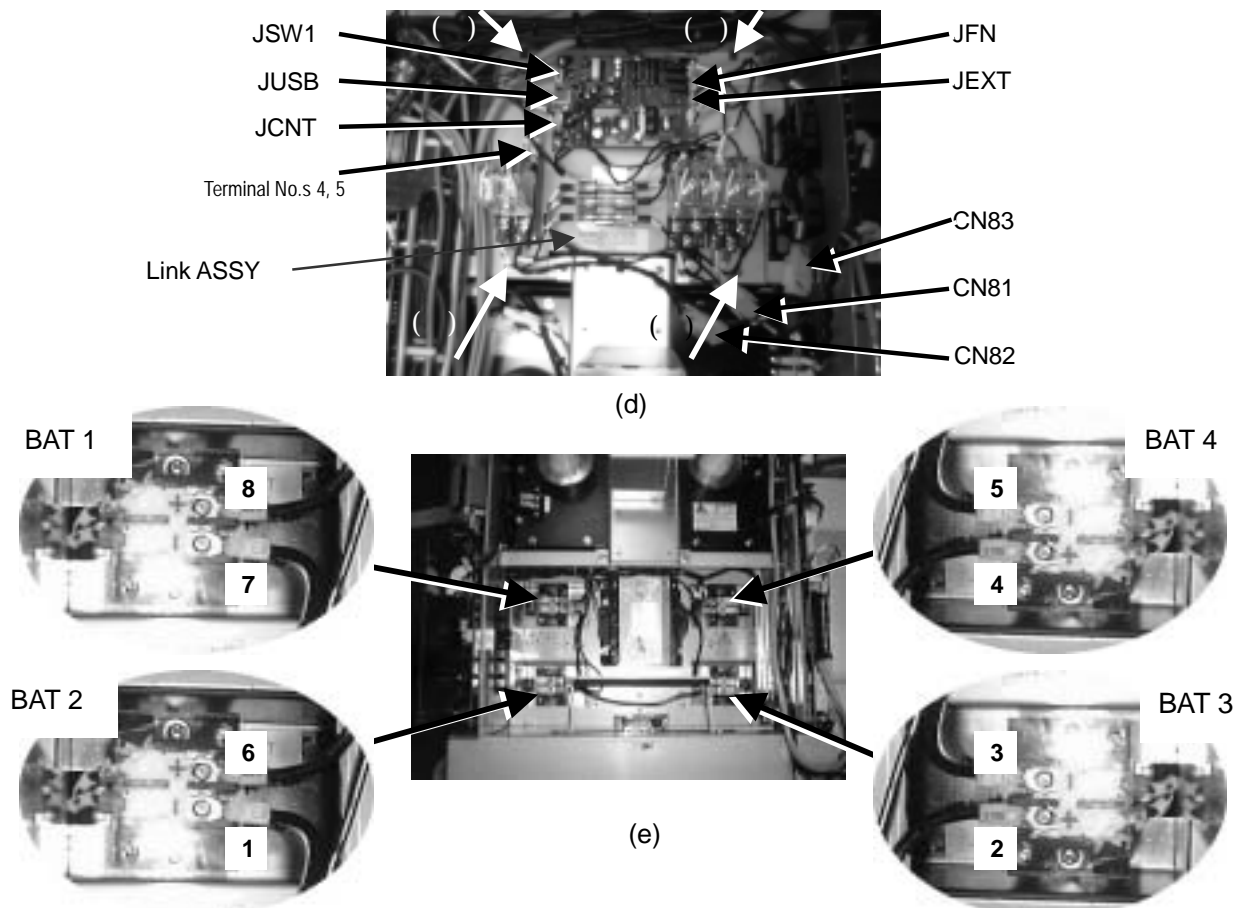
2. Turn OFF the key switch and OFF the main breaker as well.
3. Unscrew the hexagon socket head cap screws on both side (Fig. 2 (a)), and remove the FPD box.
4. Remove both of the side covers and the upper cover.
5. Remove the Fix plates which are fixing the main frame and DR assy.
6. Disconnect the cable on DR assy. However, the cable between FPD and POWER BOX is not disconnected.
7. Detach the PC holder and remove the PC. Remove the LAN adapter that connects the PC and cable reel at the same time. Fig. 2 (c)
8. Remove the six screws as shown in Fig. 2 (c), pull out the DR assy.
9. Referring to Fig. 2 (d), remove the two screws shown with white arrow (α), loosen the two screws shown with white arrow (β), and detach the connector shown with the black arrow. Then, lift the Link ASSY to remove.

10. Disconnect the wires connected to the terminal block in the order (from No.1 to No.8) of the numbers shown in Fig. 2 (d). Be sure to disconnect them in order first from (-) terminal of BAT 2 (refer to Fig. 2 (d)).
11. Take out the four battery ASSY (BAT1, BAT2, BAT3, BAT4) from the main unit, and open the cover by unscrewing the flat countersunk head screw shown in Fig. 2 (e), and disconnect the wiring for the battery. Take out all the batteries.
12. Insert new batteries, and connect the wires to the electrodes. Be careful that, as for BAT2 and BAT4, their direction of battery is turned upside down.

Rear view of the unit



Upper view of the unit



Battery ASSY

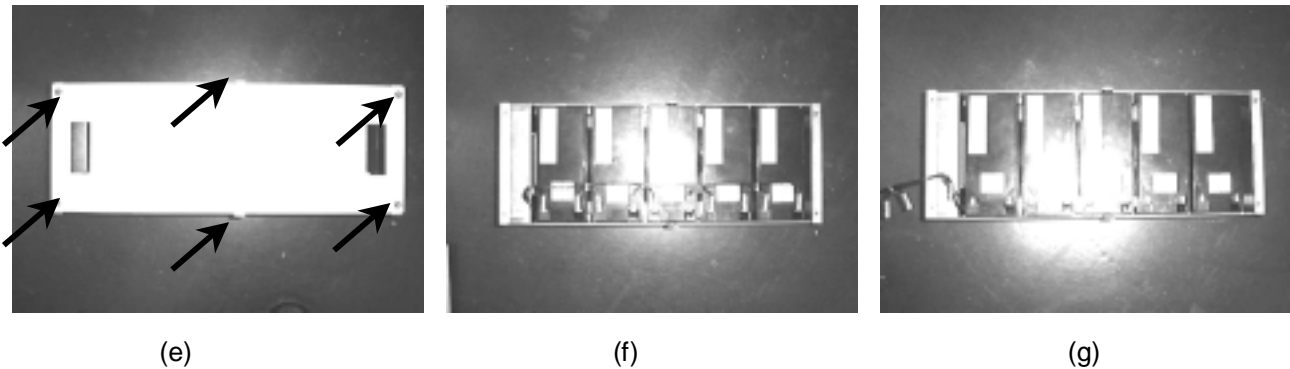


Fig. 2 Procedure of battery exchange

13. Close the cover of the battery ASSY.
14. Write battery code and manufacture date of new battery in the label on top of battery ASSY.
15. Mount the battery ASSY to the original position. Pay attention to the battery numbers and positions. (Refer to Fig. 2 (d).)
16. Connect the wires to the terminal block of battery ASSY in the reverse order of shown 5.
Connect the wires to the terminal block in the reverse order (from No.8 to No.1) of the numbers shown in Fig. 2 (d). Be sure to connect them in order first from (+) terminal of BAT 1 (refer to Fig. 2 (d)).
17. Write the date of battery replacement in the Battery Replacement Label. (Refer to Fig. 2 for the location of the label.)
18. Mount the Link assy and connect the cables.
19. Mount the DR assy and fix it with Fix plates.
20. Mount the top cover and side cover.
21. Mount the FPD box.
22. Turn ON the main breaker, and turn ON the key switch. Confirm that



The weight of a battery assembly unit is approximately 16kg. Take care of dealing with the battery assembly.

***E.3* CPU Backup Battery Replacement**

CPU Backup Battery replacement

Parts Number of the CPU Backup Battery is 501-78646.

■ Procedures of replacement for the CPU backup battery.

- 1.*** Remove the right side cover.
- 2.*** Turn on the key switch to apply the power.
- 3.*** Replace the CPU backup battery where is on NEXSC CPU board.

E.4 Collimator lamp Replacement

Collimator lamp replacement

Parts Number of the Collimator lamp is 062-65003-02.



CAUTION

Wait for 10 minute after turning off the collimator lamp. There is dread of the burn.

Procedures of replacement for the collimator lamp.

1. Turn the key switch off.
2. Remove the lamp cover with the 4 screws.
3. Remove the lamp screened cover with 2 screws
4. Change the lamp.
5. Reinstall these covers.



NOTE

Do NOT touch to part of the quartz. If part of the quartz was made dirty, clean it up by using alcohol. Finger print or oily dirt may causes dimness of the quartz bulb.

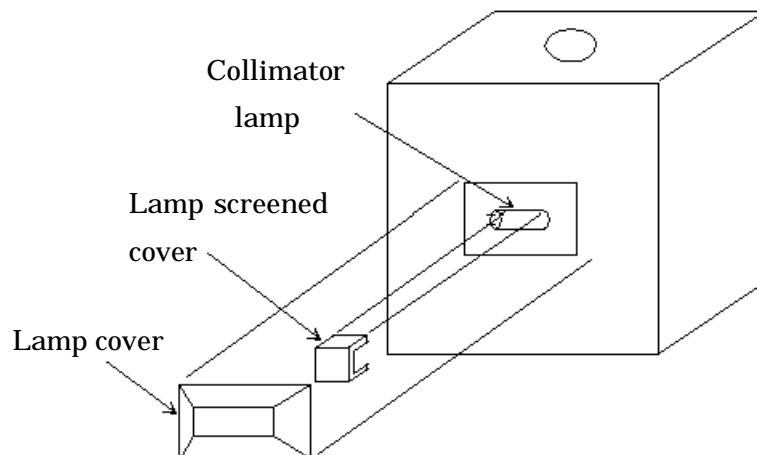


Fig. 3 Exchanging the collimator lamp

E.5 Maintenance of rotary X-ray tube section

If the rotation of the X-ray tube section is found to be abnormal or short of lubrication, grease part and as shown in Fig. 4 (Fig. 5, Fig. 6, and Fig. 7 for the detail of part A, B, and C).

* Recommended grease: Albania grease.



CAUTION

Be sure to hold the weight at the front of the support stand before making maintenance.

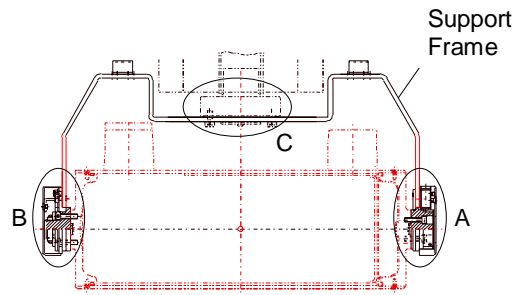


Fig. 4 X-ray tube section

Greasing Part [A] of the X-ray tube section

The detailed drawing of Part [A] of Fig. 4 is shown in Fig. 5.

Greasing steps

1. Unscrew M4 flat countersunk head screw (a) and remove cover A.
2. Unscrew locking screw (b), and make plunger (c) loose.
3. Unscrew two M3 flat countersunk head screws (d), and remove cover C.
4. Unscrew four M6 hexagon socket head cap screws (e), and remove bearing A.
5. Grease part .
6. Bearing A and X-ray tube are separated each other by unscrewing four M6 hexagon socket head cap screws (f).

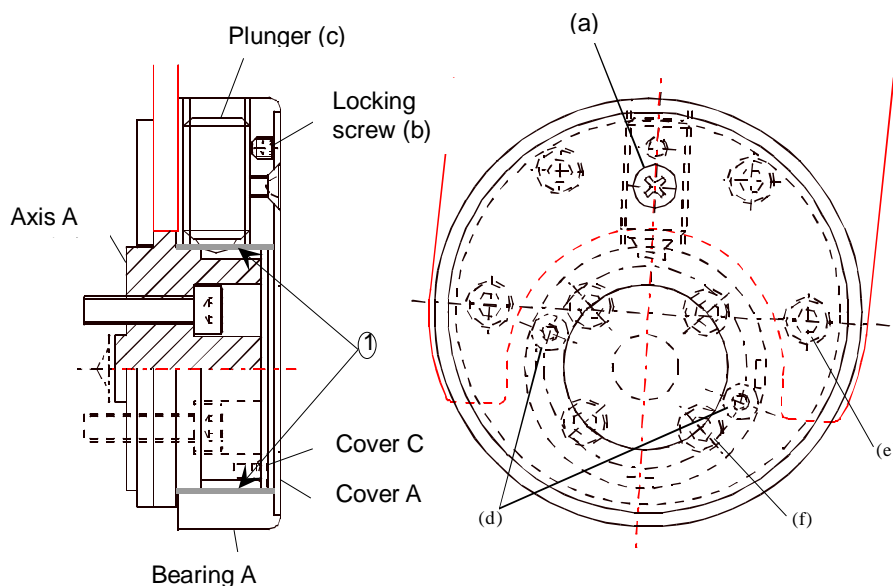


Fig. 5 Detail of Part A

Greasing Part [B] of the X-ray tube section

The detailed drawing of Part [B] of Fig. 4 is shown in Fig. 6.

Greasing steps.

1. Unscrew M4 flat countersunk head screw (g) and remove cover B.
2. Unscrew four M5 hexagon socket head cap screws (h), and remove the X-ray tube from the holding frame.
3. Put the X-ray tube removed from the holding frame on a table or the like. (Use a cushion under the tube.)
4. Unscrew locking nut (i), disc spring (j), and M5 hexagon socket head cap screw (k), and remove bearing B. In this state, bearing B and X-ray tube can be separated each other.
5. Grease Part .

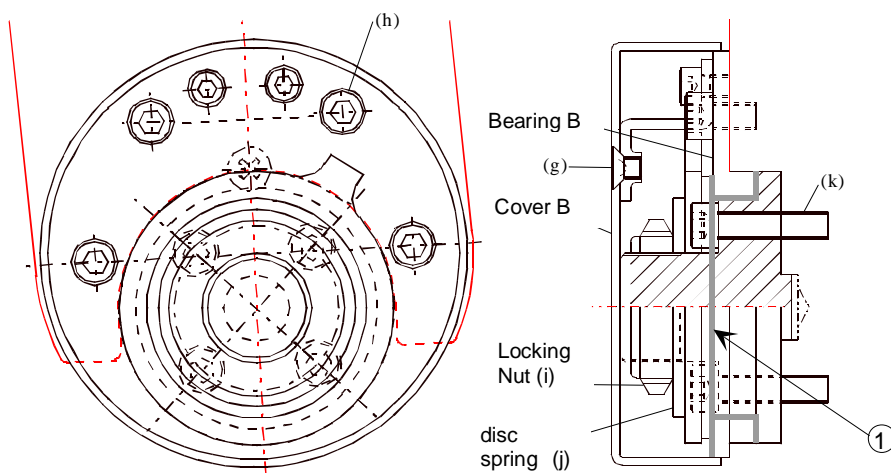


Fig. 6 Detail of Part B



Before removing the X-ray tube (approximately 13 kg), grasp the detail of the fixing structure. Be careful not to drop the tube by loosening other bolts incautiously. Dropping the tube may cause the break of the tube and injury.

Greasing Part [C] of the X-ray tube section

The detailed drawing of Part [C] of Fig. 4 is shown in Fig. 7. After assembling the X-ray tube section, make it rotate 10 to 20 times to be thoroughly lubricated by the grease.

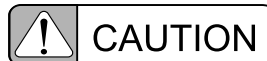
Greasing steps

1. Unscrew hexagon socket flat countersunk head screw (l) and remove the end cover.
2. Unscrew locking screw (m), and make plunger (n) loose.
3. Unscrew locking nut (o), disc spring (p), detent washer (q), and thrust washer (r).
4. Pull out the bearing toward the front, and remove it.
5. After making sure that there is nothing abnormal with Part , apply grease there.
6. After applying grease to Part and , assemble the X-ray tube section in the reverse steps.



NOTE

If the dent on axis A is widened by the plunger in Part A, rotate the axis 90 degrees to fix it.



CAUTION

If the dent on axis A is widened by the plunger in Part A, rotate the axis 90 degrees to fix it.

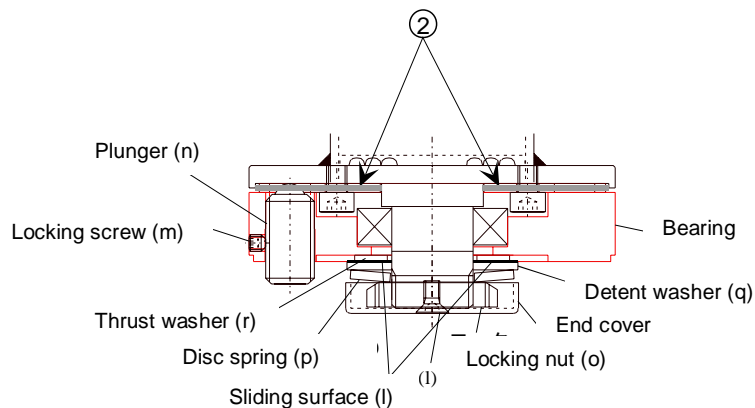


Fig. 7 Detail of C

**CAUTION**

Assemble the X-ray tube section so that the plunger in Part A, locking nut in Part B, and the plunger and locking nut in Part C are fixed with the following pressure and torque.

Plunger in Part A	After pushing it in to the limit with screwdriver, turn it back 45 degrees to fix.
Locking nut in Part B Fig. 6(i)	Adjust it so that the rotating torque becomes 4.5 ± 1.5 kg at the end of the collimator handle.
Locking nut in Part C Fig. 7(o)	After adjusting the plunger similarly as in Part A, adjust it so that the rotating torque becomes 4.5 ± 1.5 kg at the end of the collimator handle.

***E.6* Centering the Collimator and X-Ray Focus**

There are following two kinds of discrepancy between the collimator illumination field and X-ray irradiation field. When installing the apparatus, make sure which discrepancy is occurring and adjust the discrepancy:

1. Discrepancy between the collimator illumination field center and X-ray irradiation field center.
2. Discrepancy between the collimator illumination field size and X-ray irradiation field size.

Discrepancy between the collimator illumination field center and X-ray irradiation field center.

How to adjust the collimator illumination field center and X-ray irradiation field center.

If the center axis of the collimator blades and the axis of conical X-ray beam are discrepant when the collimator is mounted on the X-ray tube, the collimator illumination field center shifts from the X-ray irradiation field center.

In this case, align the center axis of the collimator blades with the axis of conical X-ray beam by moving the collimator itself without displacing the lamp mounting board as follows:

1. Show the illumination field on a cassette placed on the exposure top panel (10-cm square).
2. Put a piece of line solder along the four sides of the illumination field and operate exposure.
3. Then, widen the illumination field further (15-cm square), leaving the line solder as it is.
4. Operate another exposure (double exposure).
5. After developing the radiograph, compare the illumination field center (center of the image of the line solder) with the X-ray irradiation center, and measure the discrepancy between them.
6. As shown in the illustration on the next page, loosen the screw a little, and correct the above discrepancy in no. 5. by adjusting the position where the screw is to be tightened. After making sure that the discrepancy is eliminated, firmly tighten the screw, and then replace the screw or leave it a loosened.



CAUTION

Because the center of the collimator blades and the illumination field center are aligned each other using a dedicated device in factory assembling, never move the lamp mounting board.

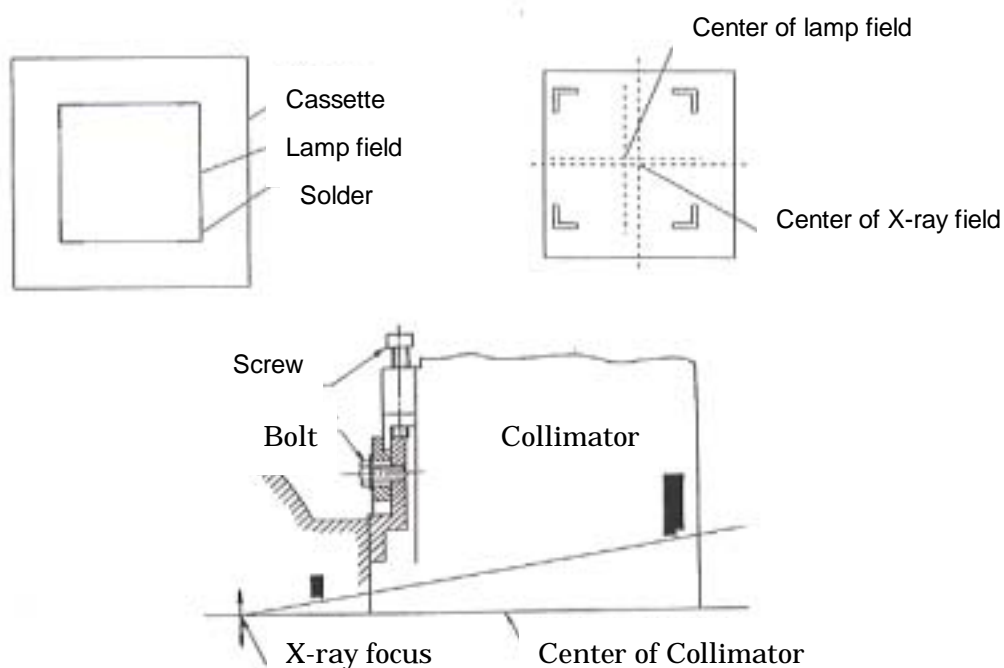


Fig. 8 Adjust field center

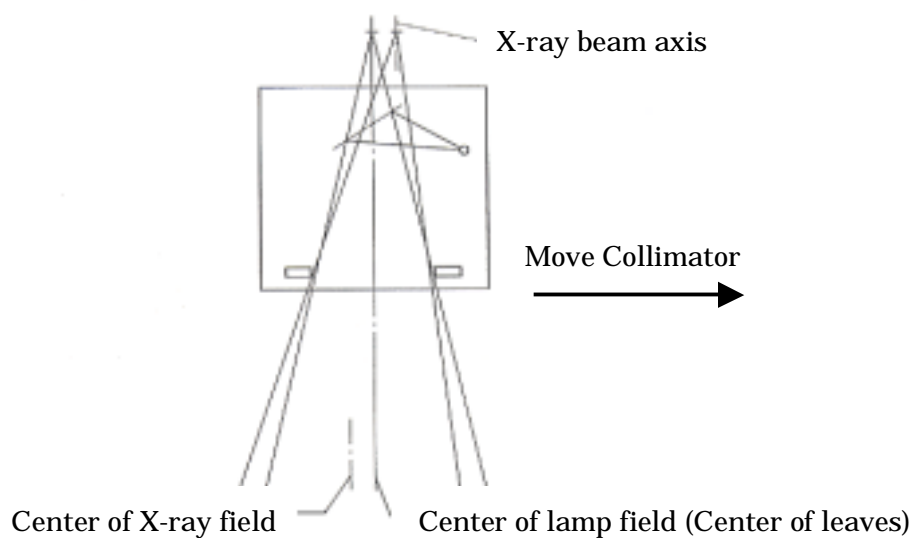


Fig. 9 How to adjust center

Discrepancy between the collimator illumination field size and X-ray irradiation field size.

How to adjust the collimator illumination field size and X-ray irradiation field size.

The illumination field size is always different from the X-ray irradiation field size. Because the filament size of illumination lamp is larger than 3 mm in comparison with the X-ray focus size (less than 1 mm), a portion called half-shadow is physically occurs on the illumination field, and due to the half-shadow the illumination field becomes larger than the X-ray irradiation field.

Discrepancy between the illumination field and X-ray irradiation field is adjusted minimum discrepancy at S.I.D 1m. Because the half-shadow is a physical phenomenon, it is impossible to eliminate it.

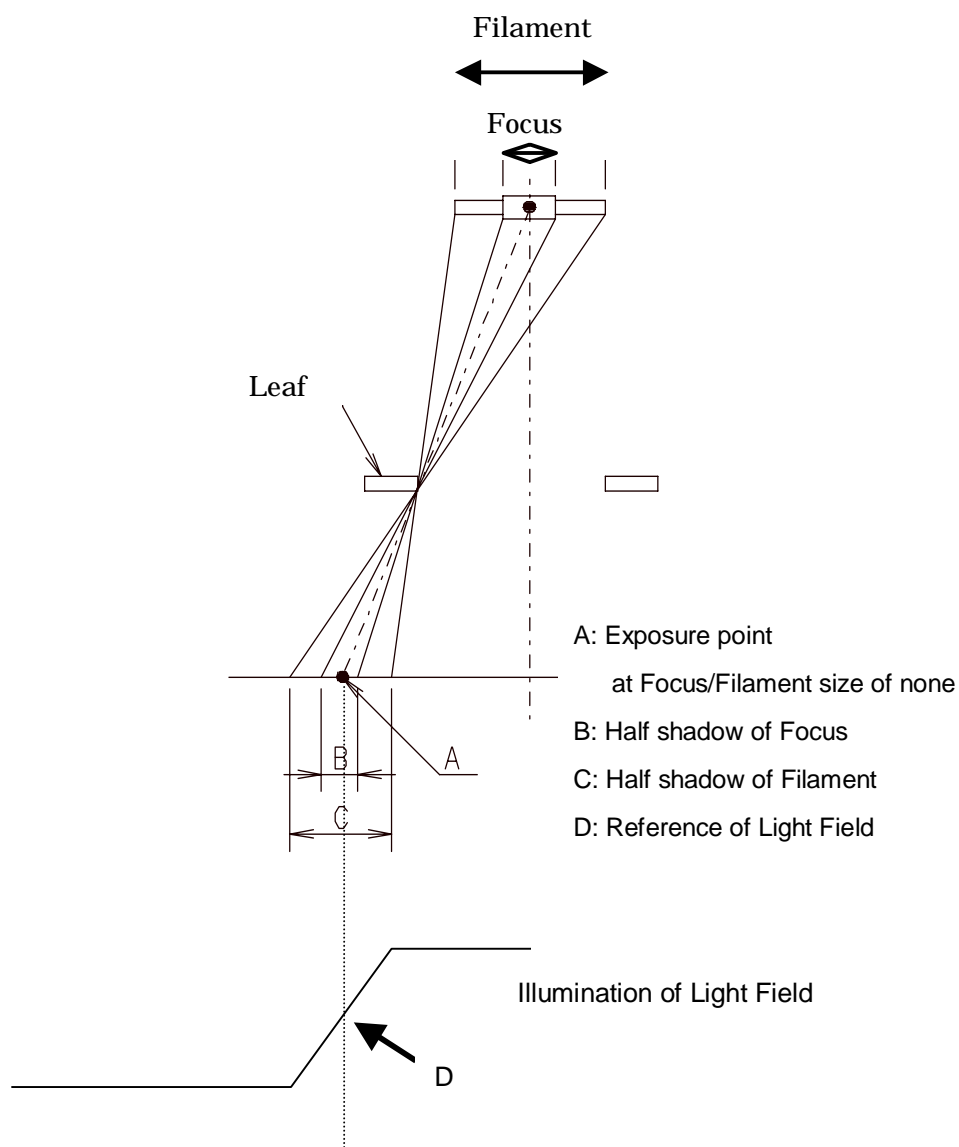


Fig. 10 Discrepancy between the collimator illumination field and X-ray irradiation field.

For reference

Adjust the X-ray irradiation field size so that the edge of the X-ray irradiation field is set on the point D of the edge of the illumination field, after determining the illumination field size in accordance with the exposing portion of the subject.

In this way discrepancy between the collimator illumination field center and X-ray irradiation field can be minimized.

Discrepancy between the Point D and X-ray irradiation field is conformed to IEC regulation, adjusted within 2cm (within 2% of S.I.D) at S.I.D 1m prior to shipment.

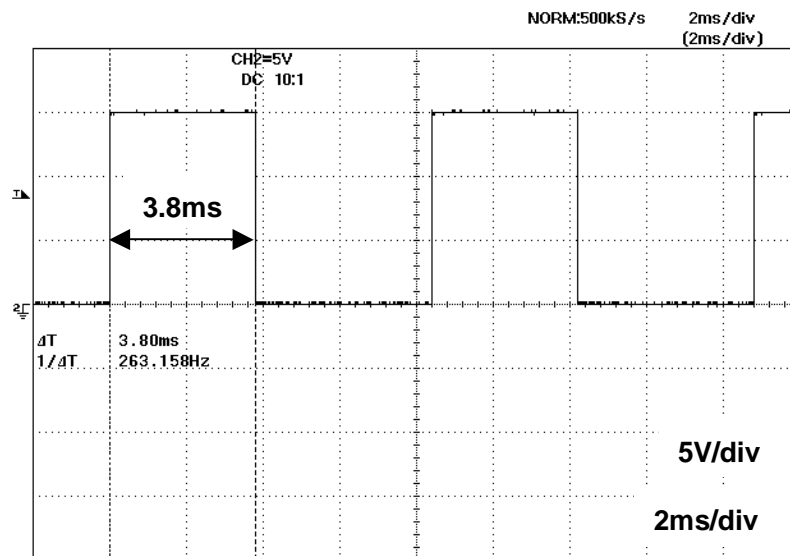
E.7 Adjustment of Collimator lamp voltage

I. Basical adjustment of Collimator lamp voltage

Collimator lamp voltage can be adjusted by adjusting pulse width on MUX CHARGE-04A PCB. Detailed procedure is as follows,

- (1) Disconnect the connector JCH2 form MUX CHARGE-04A PCB for preventing lamp from getting excessive voltage during adjustment.
- (2) Connect oscilloscope to CP17 (IC M8 pin No.1) and GND on MUX CHARGE-04A PCB.
- (3) Turn on the unit. (Turn on the key switch.)
- (4) Press the Collimator lamp switch and execute (5) in 30 seconds.
- (5) Adjust the VR1 [LAMP] on MUX CHARGE-04A PCB so that the pulse width (+15V level) is 3.8ms (+/- 0.1ms).

See the below figure.



- (6) Turn off the unit. (Turn off the key switch.)
- (7) Connect the connector JCH2 to MUX CHARGE-04A PCB that was disconnected in (1).

2. Note when measuring lamp voltage



Use the voltage meter that can measure true r.m.s. value (root mean square value). Normal voltage meter can't measure exactly because lamp voltage is not sine waveform.

For reference, the voltage (r.m.s. value) will be 10.5 - 11.5V at lamp leads when the pulse width is adjusted to 3.8ms.

- Make the pulse width wider when needed to increase illumination.
- Make the pulse width narrower when needed to decrease illumination.



Pay an attention to the voltage of lamp when increasing illumination. Lifetime of lamp will be drastically shorter when the voltage of lamp is over 12V.



Pay an attention to the illumination when decreasing illumination. The illumination should fullfill standards.

E.8 Cleaning and disinfections

Cleaning and disinfections

How to Cleaning and disinfections



This equipment is not protected to permeation of a liquid.

Don't let a liquid permeate the inside of equipment in cleaning and disinfections.

1. Check the equipment is turned off power.



Cleaning and disinfections work should work, after turning off equipment power.

If equipment is turned on the power, there is a possibility of causing an electric shock and a short circuit.

2. Cleaning and disinfections work are done.

Clean with the cloth into which alcohol or the antiseptic was infiltrated.

Do cleaning and disinfections work certainly also to what has unevenness in the surface using a swab etc.



Do not splash antiseptic on this equipment. Do not spray of the antiseptic on this equipment directly.

If an antiseptic goes into the inside of equipment, it will become failure and the cause of the accident.



Do not use the following antiseptics.

When the following antiseptics are used, the performance and safety of equipment cannot be guaranteed.

1. Chlorine type antiseptic
2. The antiseptic, which corrodes metal and plastic rubber, or paint
3. The antiseptic which unsuited metal and plastic rubber, or paint
4. A spray gas type antiseptic
5. A volatile antiseptic
6. An antiseptic with a possibility of entering the inside of a product.

3. After a cleaning and disinfections work end, should be checked the following item, before switching on a power supply of equipment.
 - (1) Neither water nor the antiseptic has adhered to equipment.
 - (2) The tool used for cleaning and disinfections work is tidied up.

**WARNING**

When you switch on a power supply after cleaning and disinfections work, do fully ventilate the inside of a cleaning and disinfections working space.

If inflammable gas remains cleaning and disinfections working space, when a power supply is switched on, there is danger of ignition, emitting smoke, explosion, and an electric shock.

Notes in the case of taking over, return of apparatus etc..

Notes in the case of taking over, return of apparatus etc..**WARNING**

In the medical institution where the various microbes which affect a human body exist, a certain incubation period may be set by infection, and it may suffer from the "infection" which appears and is attacked with condition.

In connection with carrying out of the product in the case of recession from a medical institution, a tool, etc., there is the possibility of secondary infection out of a medical institution.

In order to prevent this, disinfections and positive implementation of sterilization are important with a prevention measure and healthy management.

1. General notes

In order to carry out positive disinfections and to prevent secondary infection, demand implementation of disinfections in a medical institution as much as possible.

For the sake of appearance, the existence of contamination is unclear. Should be sure to perform a listening comprehension check to medical institution staffs.

2. Handling cautions of disinfections

Wipe external surface with the cloth dipped with glutaraldehyde (GA) liquid 2%.

Parts (especially machine part) are decomposing in the range, which can be decomposed.

Parts wipe with the cloth dipped with glutaraldehyde (GA) liquid 2%, or disinfect by ethylene oxide gas.

E.9 DR system - MUX communication

Operation Check

■ connecting cable

Connect the cross-type RS232C cable (9Pin female) with the RS232C connector(male) of PC and MUX (CPU board).

■ Confirmation of operation

1. Confirmed of CPU board, PC, and CXDI cable connecting. Afterwards the power supply of MUX is turned on.
 2. Confirmed of the MUX system normal starting. Afterwards the power supply of CXDI is turned on.
 3. When the protocol of CXDI is selected after it is confirmed that CXDI started normally, the control data (APR number) is transmitted to MUX. Confirm whether the APR display on the MUX sheet key was changed according to the control data (APR number).
 4. Confirmed on the CXDI about the X-ray exposure execution data is transmitted when MUX does X-ray exposure.
-

Communications Specifications

■ Communication protocol

The communications protocol is described below.

1. The master station requests establishment of a data link.
 1. The master station generates an "ENQ" message to request establishment of the data link.
 2. The slave station sends "ACK" to permit establishment of the data link. If the data link cannot be established, the slave station sends "NAK".
 3. If the slave station does not return "ACK" within 2 seconds, DR SYSTEM retransmits "ENQ" (up to three retransmissions).
2. The master station transmits the required message.
 1. The master station sends a message starting with "STX".
 2. The slave station checks the message. If the message is evaluated to be correct, the slave station transmits "ACK"; otherwise it transmits "NAK".
 3. If the master station receives "NAK", it retransmits the same message ("NAK"). (up to three retransmissions)
3. The master station closes the data link.
 1. The master station generates an "EOT" message to close the data link.

■ Message Format

The communications protocol is described below.

Supports a text block from STX to BCC of variable length up to 127 bytes.
The command format appears below.

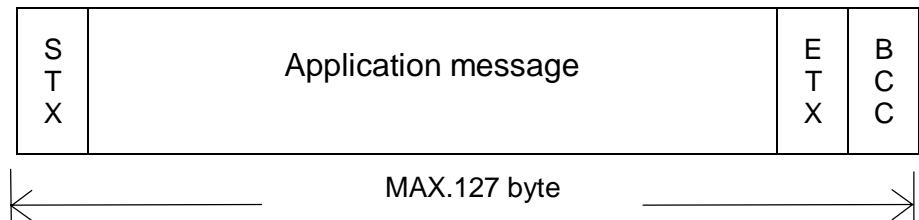


Fig. 11 Command format

STX: 0X02
ETX: 0X03
BCC: horizontal parity
<Exclusive OR to ETX (excluding STX)>

Error Processing
Parity check on each error detected data
(Horizontal parity checks on each message unit.)

■ Physical Layer

1. Electrical specifications RS-232C
2. Transmission mode: half duplex, asynchronous
 - (1) Start bit 1 bit
 - (2) Data 8 bit
 - (3) Parity 1 bit (even)
 - (4) Stop bit 1 bit
3. Transmission rate: 4800 bps
4. Communications specifications
Connect to D-SUB9pin (Female) Cross-type RS232C cable.

FG RX TX RTS CTSDSR DTRGND

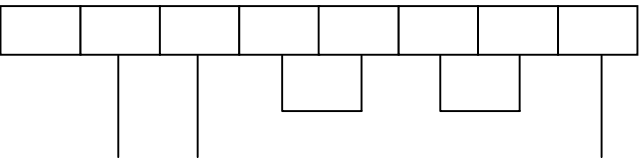


Fig. 12 Location of unit side Dsub-9 pin (male)

■ Data Link Layer

1. Protocol conforms to JIS-X-5002

- | | |
|-----------------------------|---|
| (1) Transmission code | 8-bit code prescribed in JIS-X-0201
(not including *, @, or ? codes) |
| (2) Response mode | ACK, NAK |
| (3) Error check protocol | BCC (text block horizontal parity) XOR from
character after STX to ETX |
| (4) Error correcting method | automatic re-transmission |
| (5) Transmission rate | 4800 bps |

2. Basic transmission control protocol.

The communications protocol is described below.

- (1) The master station requests establishment of a data link.
 1. The master station generates an "ENQ" message to request establishment of the data link.
 2. The slave station sends "ACK" to permit establishment of the data link. If the data link cannot be established, the slave station sends "NAK".
 3. If the slave station does not return "ACK" within the specified time (RT1 in Table 2), the master station retransmits "ENQ". (For maximum number of retransmissions, see RT1, Table 2).
- (2) The master station transmits the required message.
 1. The master station sends a message starting with "STX".
 2. The slave station checks the message. If the message is evaluated to be correct, the slave station transmits "ACK"; otherwise it transmits "NAK".
 3. If the master station receives "NAK", it retransmits the message. (For maximum number of retransmissions, see RT2 in Table 3).
- (3) The master station closes the data link.
 1. The master station generates an "EOT" message to close the data link.
 2. Details comply with implementation specifications (Z30N0161).
 3. Maximum text block length up to 127 bytes.

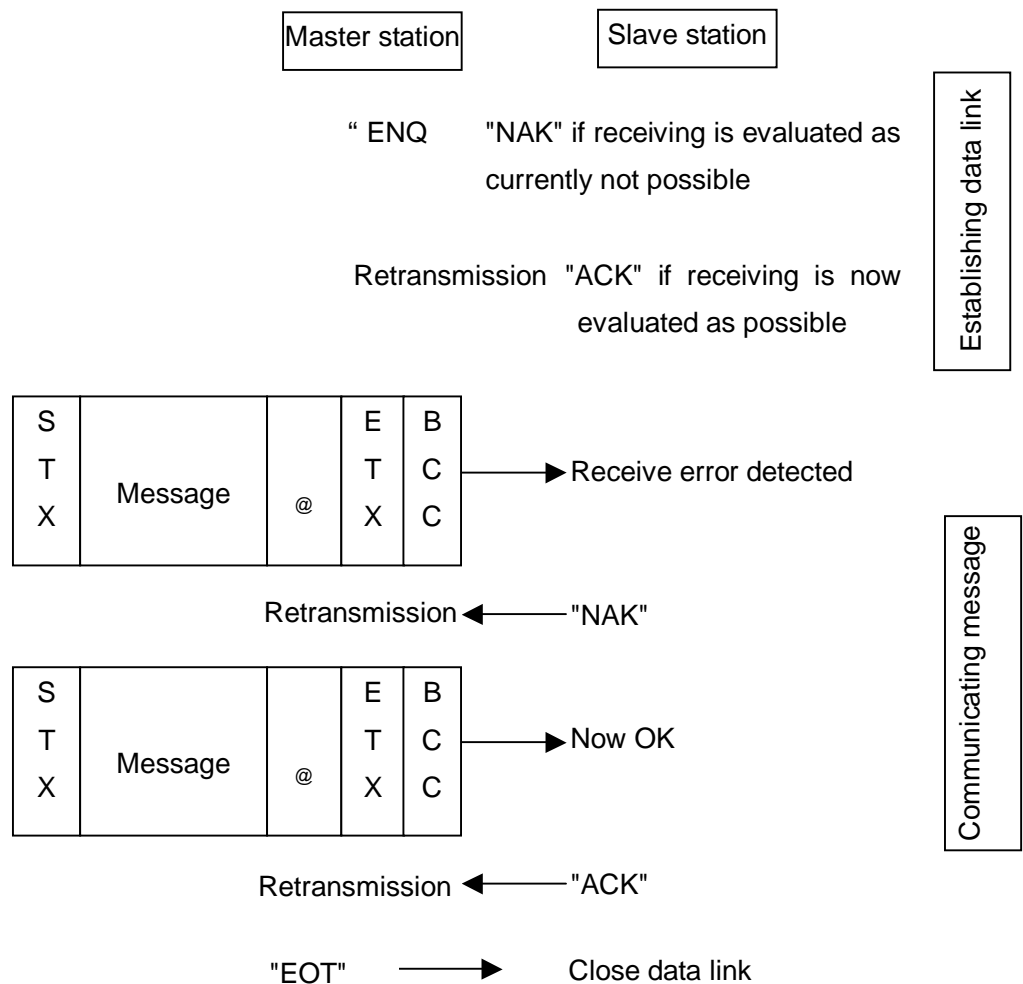


Fig. 13 Transmission control protocol

3. Parameters

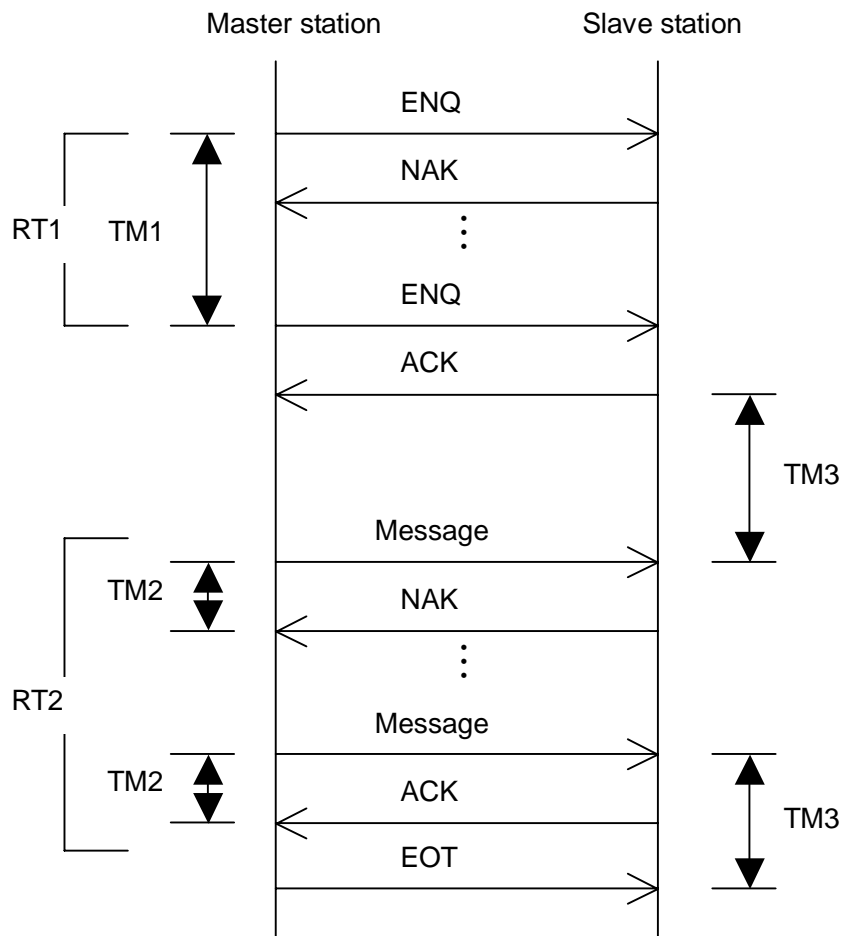


Fig. 14 Transmission control protocol and Parameter

Table. 2. Parameter

	Items	DR system	MUX
TM1	Pause time before ENQ retransmission when establishing data link	2.0 sec	3.0 sec
RT1	Number of ENQ retransmissions when establishing data link	3 times	3 times
RT2	Number of retransmissions when sending message	3 times	3 times
	Maximum text length (excluding STX, ETX, ETB, and BCC)	124 byte	124 byte
TM2	Response monitoring time	2.0 sec	2.0 sec
TM3	Receiving timeout time	2.0 sec	2.0 sec

■ Application Layer

1. Message format

Supports a text block from STX to BCC of variable length up to 127 bytes.

However, details of the actual text used is described in section 11.12 Details of Transmitted Text.

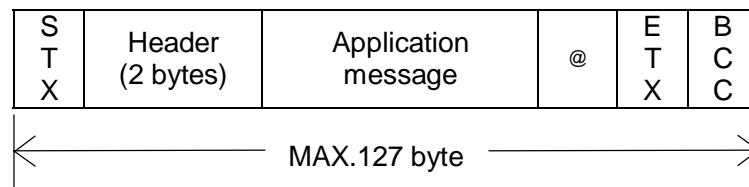


Fig. 15 Message format

STX : 0 × 02

ETX : 0 × 03

BCC : horizontal parity Exclusive OR to ETX (excluding STX)

1. A command contains the following three fields:
 - i. Header The header is represented as a 2-byte code.
 - ii. Message Expressed in JIS 8-bit code.
 - iii. Terminator One-byte field indicating the end of the message.
2. Error Processing
 - i. Parity check on each error detected data
(Horizontal parity checks on each message unit.)

2. Header Table

Table. 3. Header table

DR system → MUX		MUX → DR system	
Header	Message contents	Header	Message contents
80	Serial circuit test response	00	Serial circuit test request
B1	Exposure condition instruction transmission	31	Implementation condition transmission

Communication Sequence

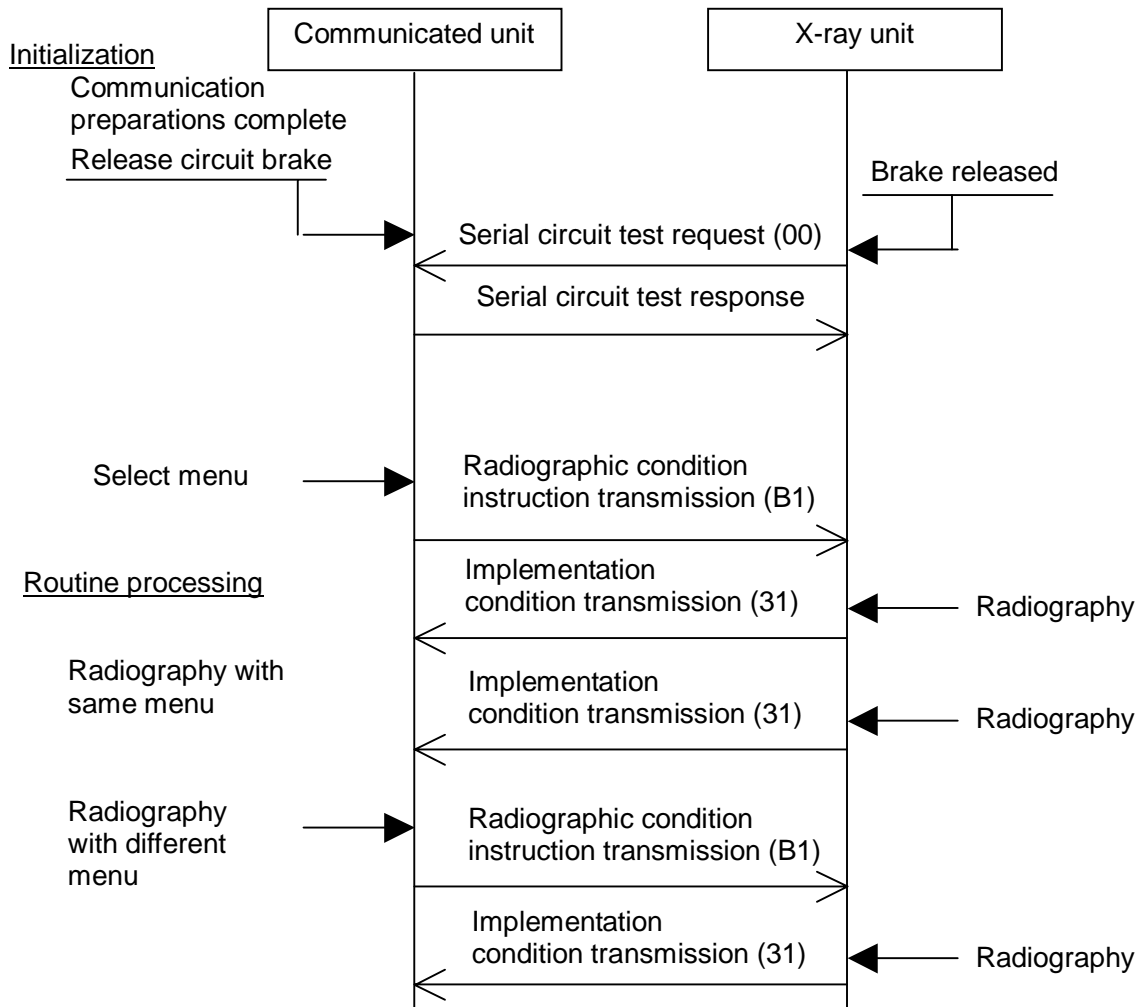


Fig. 16 Communication sequence

Details of Transmitted Text

1. Circuit test request (MUX → DR system)

Test data to test the serial circuit from the MUX to the DR system.

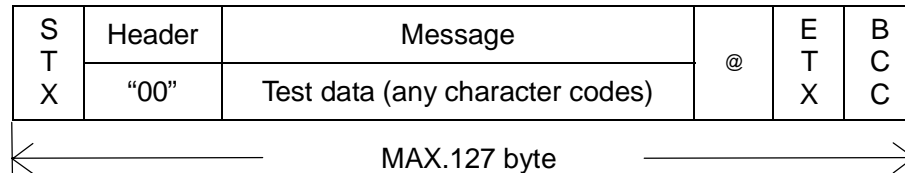


Fig. 17 Transmitted Text format (Circuit test request)

The test data can include any characters between "STX" and "BCC", up to a length of 127 bytes. After the DR SYSTEM circuit brake release is detected, the MUX waits at least one second before transmitting ENQ for the 00 command.

2. Circuit test response (DR system → MUX)

This is the response to the circuit test request in (1) above.

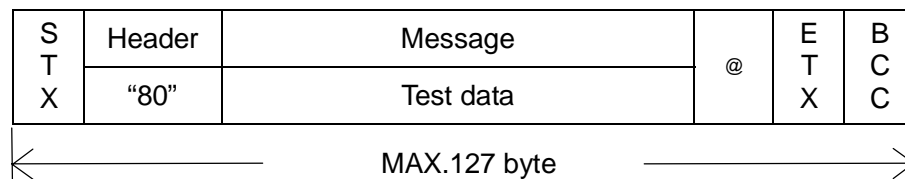


Fig. 18 Transmitted Text format (Circuit test response)

The DR system returns the data sent by the MUX unchanged. The MUX compares the returned data to the data sent in the circuit test request; if the data matches, the circuit is established. If the data does not match, the circuit test request is repeated. The DR system waits up to 5 seconds from receiving the "00" command (i.e., receiving "EOT") before transmitting ENQ for the "80" command.

3. Exposure condition instruction transmission (DR system)

The DR system makes settings for the MUX, including Exposure conditions and automatic exposure conditions.

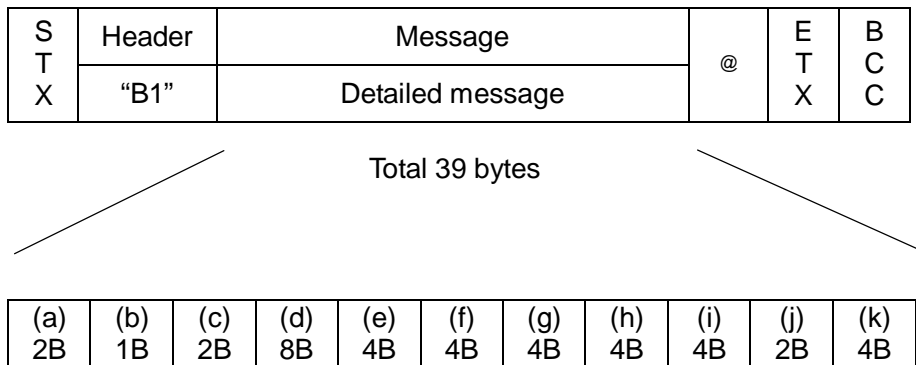


Fig. 19 Exposure condition instruction transmission format

Table. 4. Message details

Item	Bytes	Description
(a)	2B	Manufacturer/model code for connected instrument
(b)	1B	Radiography/Fluoroscopy flag
(c)	2B	Tube/Technique code
(d)	8B	Film-related code (disabled)
(e)	4B	Tube voltage
(f)	4B	Tube current
(g)	4B	Exposure time
(h)	4B	APR protocol number code
(i)	4B	Automatic exposure mechanism
(j)	2B	ID code (fixed as "00")
(k)	4B	Focus code



NOTE

The CXDI side of the unit determines exposure condition by transmitting APR numbers to the MUX side.

4. Implementation condition transmission (DR system)

Data for actual radiography.

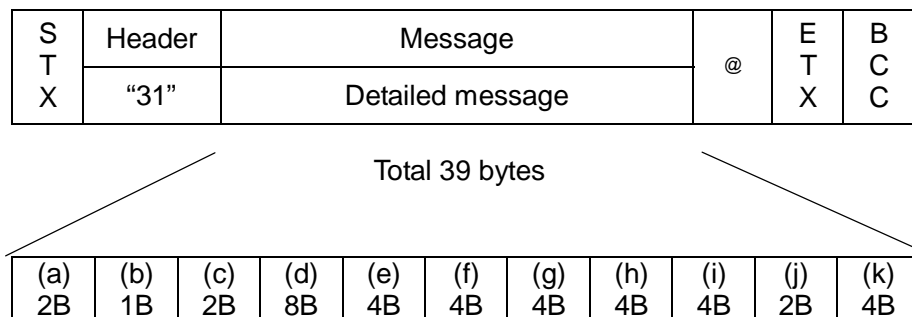


Fig. 20 Implementation condition transmission format

The implementation data transmits the radiography setting or measured value corresponding to each Exposure condition instruction, as shown in the table below.

Table. 5. Message details

Item	Description
(a) Manufacturer/model code for connected instrument	"01"
(b) Radiography/Fluoroscopy flag	Fixed as "0"
(c) Tube code Technique code	Tube code for the selected technique Actual code used for radiography
(d) Film-related code	Disabled * Note 1
(e) Tube voltage	Actual condition used for radiography
(f) Tube current	Actual condition used for radiography
(g) Exposure time	Actual condition used for radiography
(h) APR code	APR protocol number code
(i) Automatic exposure mechanism	Actual code used for radiography
(j) ID code	Disabled
(k) Focus code	Tube focus used for radiography

- (a) Manufacturer/model code for connected instrument
Fixed as "01"
- (b) Radiography/Fluoroscopy flag
Fixed as "0" because fluoroscopy is not applicable
- (c) Tube code/Technique code
Fixed as tube-"0"-Tube1, technique-"2"-Bucky1 at this system

X	X
Select tube	Selected technique
0 : Tube1	2 : Bucky1

- (d) Film-related code
Fixed as "00000000"
- (e) Tube voltage
With this unit, exposure condition transmitted from CXDI to MUX is notified with an APR number.
Indicates the tube voltage used for radiography in 1 kV steps between 0040 and 0125 kV. Illegal transmitted values are ignored.
- (f) Tube current
With this unit, exposure condition transmitted from CXDI to MUX is notified with an APR number.
Indicates the tube current used for radiography as 4 digits between 0010 and 160 mA. Steps for MUX are: 50,63,80,100,125,160mA. The settable values may vary according to the system composition. Transmitted illegal values are ignored.
- (g) Exposure time
With this unit, exposure condition transmitted from CXDI to MUX is notified with an APR number.
Indicates the exposure time used for radiography between 0001 and 8000 ms. The exposure time steps are:
1,1.2,1.6,2,2.5,3.2,4,5,6.3,8,10,12,15,20,25,32,40,50,63,80,100,125,160,200,250,320,400,500,630,800,1000,1250,1600,2000,2500,3200,4000,5000,6300,8000,10000ms.
However, only 1, 2, 4, 5, and 8 ms are valid below 10 ms. Transmitted illegal values are ignored.

(h) APR code (Protocol Number code)

Used to transmit APR numbers.

DR system send to Program Code for MUX APR memorized exposure conditions.

Protocol Code

0001 to 0072

radiography area..... 8

Head, Chest, Abdomen, Waist, Leg, Foot, Arm, Hand

radiography direction.....3

Front (AP), Side (Lateral), Oblique

Body thickness.....3

Thin, Normal, Obese

$8 \times 3 \times 3 = 72$ types

(i) Automatic exposure mechanism (phototimer)

With this unit, automatic exposure mechanism (phototimer) is not used.

Fixed as "0" because AEC system is not used this system. The film sensitivity, film density, and phototimer detection field are ignored the phototimer is not used.

(j) ID code

Fixed as "00"

(k) Focus code

Fixed as focus size-"1000"- large focus at this system.

5. Reference Material

xx 0 x x 00000000 xxxx xxxx xxxx xxxx 00 xxxx

(1) (2) (3) (4) (5) (6) (7) (8) (9)

- (1) X-ray unit manufacturer/model code set in CXDI
Fixed as "01."
- (2) Tube codes set in CXDI
Technique and tube codes need to be set on CXDI.
Set the tube code for CXDI at "0" (tube 1) when connecting with MUX.
- (3) Technique codes set in CXDI
Technique and tube codes need to be set on CXDI.
Set the technique code for CXDI at "2" (bucky 1) when connecting with MUX.
- (4) Tube voltage
- (5) Tube current
Tube voltage and tube current do not need to be set on CXDI when connecting with MUX. With the unit, exposure condition transmitted from CXDI to MUX is notified with an APR number.
- (6) Exposure time
Exposure time does not need to be set on CXDI when connecting with MUX. With the unit, exposure condition transmitted from CXDI to MUX is notified with an APR number.
- (7) APR numbers
APR numbers are recorded in MUX and correspond to CXDI protocols. With the unit, exposure condition transmitted from CXDI to MUX is notified with an APR number. "0001" – "0072"
- (8) Relationship between CXDI phototimer-related setting and MUX
When connecting with MUX, specify the phototimer-related setting on CXDI at "0000" (phototimer is not used).
- (9) CXDI focus code
When connecting with MUX, set the CXDI focus code at "1000" (large focus).

6. DR system setting APR code

CXDI transmits APR numbers (1-72).

Relationship between APR numbers and MUX keys are as shown below.

Table. 6. List of MUX APR number code

APR number code	Filming region	Filming orientation	Body thickness correction	Default kV	Default mAs
1	Head	Front (AP)	Thin	64	14
2	Head	Front (AP)	Normal	64	14
3	Head	Front (AP)	Obese	66	16
4	Head	Side (Lateral)	Thin	56	14
5	Head	Side (Lateral)	Normal	58	14
6	Head	Side (Lateral)	Obese	61	14
7	Head	Oblique	Thin	56	18
8	Head	Oblique	Normal	59	18
9	Head	Oblique	Obese	62	18
10	Chest	Front (AP)	Thin	79	2.8
11	Chest	Front (AP)	Normal	79	3.2
12	Chest	Front (AP)	Obese	82	3.2
13	Chest	Side (Lateral)	Thin	88	3.2
14	Chest	Side (Lateral)	Normal	91	3.6
15	Chest	Side (Lateral)	Obese	95	4
16	Chest	Oblique	Thin	87	3.2
17	Chest	Oblique	Normal	90	3.2
18	Chest	Oblique	Obese	93	3.2
19	Abdomen	Front (AP)	Thin	74	56
20	Abdomen	Front (AP)	Normal	77	63
21	Abdomen	Front (AP)	Obese	80	71
22	Abdomen	Side (Lateral)	Thin	86	63
23	Abdomen	Side (Lateral)	Normal	90	63
24	Abdomen	Side (Lateral)	Obese	95	63
25	Abdomen	Oblique	Thin	78	80
26	Abdomen	Oblique	Normal	83	90
27	Abdomen	Oblique	Obese	89	100
28	Waist	Front (AP)	Thin	68	22
29	Waist	Front (AP)	Normal	68	25
30	Waist	Front (AP)	Obese	71	25
31	Waist	Side (Lateral)	Thin	82	22
32	Waist	Side (Lateral)	Normal	84	25
33	Waist	Side (Lateral)	Obese	86	28
34	Waist	Oblique	Thin	71	22
35	Waist	Oblique	Normal	74	25
36	Waist	Oblique	Obese	76	28
37	Leg	Front (AP)	Thin	63	7.1
38	Leg	Front (AP)	Normal	63	8

APR number code	Filming region	Filming orientation	Body thickness correction	Default kV	Default mAs
39	Leg	Front (AP)	Obese	66	8
40	Leg	Side (Lateral)	Thin	65	7.1
41	Leg	Side (Lateral)	Normal	68	7.1
42	Leg	Side (Lateral)	Obese	71	7.1
43	Leg	Oblique	Thin	65	8
44	Leg	Oblique	Normal	65	9
45	Leg	Oblique	Obese	65	10
46	Foot	Front (AP)	Thin	58	2.2
47	Foot	Front (AP)	Normal	58	2.2
48	Foot	Front (AP)	Obese	61	2.5
49	Foot	Side (Lateral)	Thin	57	2
50	Foot	Side (Lateral)	Normal	58	2
51	Foot	Side (Lateral)	Obese	61	2
52	Foot	Oblique	Thin	55	2.5
53	Foot	Oblique	Normal	58	2.5
54	Foot	Oblique	Obese	61	2.8
55	Arm	Front (AP)	Thin	58	2.8
56	Arm	Front (AP)	Normal	58	3.2
57	Arm	Front (AP)	Obese	61	3.2
58	Arm	Side (Lateral)	Thin	61	2.8
59	Arm	Side (Lateral)	Normal	63	3.2
60	Arm	Side (Lateral)	Obese	65	3.6
61	Arm	Oblique	Thin	60	3.2
62	Arm	Oblique	Normal	60	3.6
63	Arm	Oblique	Obese	60	4
64	Hand	Front (AP)	Thin	53	0.9
65	Hand	Front (AP)	Normal	53	1
66	Hand	Front (AP)	Obese	56	1
67	Hand	Side (Lateral)	Thin	56	0.9
68	Hand	Side (Lateral)	Normal	58	0.9
69	Hand	Side (Lateral)	Obese	60	0.9
70	Hand	Oblique	Thin	56	1
71	Hand	Oblique	Normal	57	1
72	Hand	Oblique	Obese	57	1.1

E.10 How to Restoration from Recovery CD

How to Restoration from Recovery CD

Recovery CD

When PC is returned as PC is reinstalled by the customer, it is possible to restore it by using recovery CD.

When the customer uses and restores recovery CD, it is necessary to install the software of CXDI such as CXDI software and Generator communication software. Moreover, after software is installed, peculiar setting to customers of DICOM transmission and the print, etc. is done.

One recovery CD is attached by one PC. It is not possible to restore it to other PC.

The use tools

Recovery CD

Installed tool keyboard (below keyboard)

Installation tool mouse (below mouse)

Installation tool USB hub(below USB hub)

How to Restoration from recovery CD

1. The USB hub is connected with the USB connector of Upper cover. The keyboard and the mouse are connected with the USB hub.
2. Turn on the PC while pushing the Delete key to the keyboard.
When PC starts, the Setup utility screen is displayed.



Fig. 21 Setup utility screen

3. Advanced BIOS Features is selected pushing [] key or [] key to the keyboard.



Fig. 22 Setup utility screen of selected Advanced BIOS Features

4. It is checked to have selected Advanced BIOS Features, and pushes the [Enter] key of the keyboard. The Advanced BIOS Features screen is displayed.
5. First Boot Device is selected pushing [] key or [] key to the keyboard.



Fig. 23 Advanced BIOS Features of selected First Boot Device

The setting of First Boot Device is checked.

When the setting of First Boot Device is CDROM, the [Escape] key to the keyboard is pushed.

It returns to the Setup utility screen.

When the setting of First Boot Device is not CDROM, it is checked to have selected First Boot Device, and pushes the [Enter] key of the keyboard. The setting change screen of First Boot Device is displayed.

6. First Boot Device setting is selected to CDROM for pushing [] key or [] key to the keyboard. It is checked to have selected CDROM, and pushes the [Enter] key of the keyboard. It returns to the Advanced BIOS Features screen. It is checked that the setting of First Boot Device is CDROM, and pushes the [Escape] key to the keyboard. It returns to the Setup utility screen.



Fig. 24 The setting change screen of First Boot Device

7. Recovery CD is set in the CD drive by opening the CD drive, and the CD drive is close. After it is checked that the CD drive close, the [F10] key to the keyboard is pushed. The checking screen of save the BIOS setting is displayed.



Fig. 25 The checking screen of save the BIOS setting

The [Enter] key of the keyboard is pushed. PC starts reactivating.

8. The boot starting check (startup selection) screen of PC is displayed.



Fig. 26 The boot starting check screen (startup selection screen)

2.This computer was started from a Ghost bootable CD is selected pushing [] key or [] key to keyboard. It is checked to have selected 2.This computer was started from a Ghost bootable CD, and pushes the [Enter] key of the keyboard.

9. The processing of Ghost is begun.

10. The continuation checking screen of processing is displayed.



Fig. 27 Displayed as It is Press any key to continue... in the screen

11. [C] key is pushed while pushing the [Ctrl] key to the keyboard if displayed as It is Press any key to continue... in the screen.

It is repeated to push [C] key while pushing the [Ctrl] key to the keyboard until Terminate batch job(Y/N) ? is displayed on the screen.



Fig. 28 Terminate batch job(Y/N) ? is displayed on the screen

If Terminate batch job(Y/N) ? is displayed on the screen, [Y] key to the keyboard is pushed.

12. The prompt of A:\> is displayed on the screen.



Fig. 29 The prompt of A:\> is displayed

13. c:ghost is input from the keyboard. ([:] is [;] key push while pushing the [Shift] key to the keyboard.) [Enter] key to the keyboard is pushed.

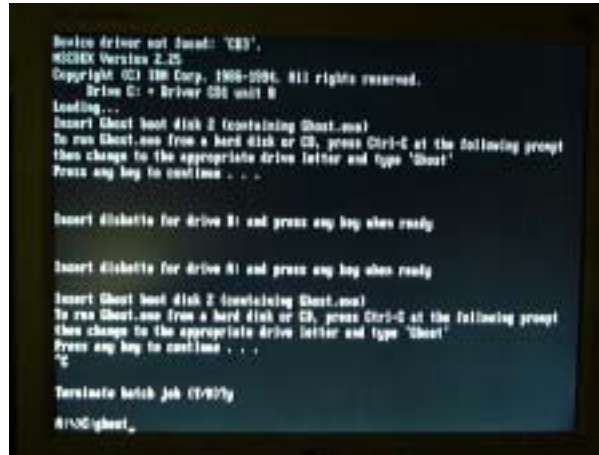


Fig. 30 display of c:ghost inputting from the keyboard

The processing of Ghost is restarted.

14. OK is clicked when becoming a screen below.



Fig. 31 Implementation condition transmission format

15. Local is clicked. Disk is clicked. And From Image is clicked.

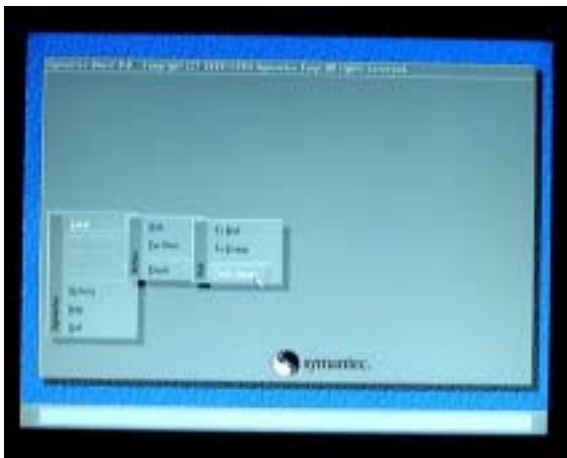


Fig. 32 display of Image select

16. The drive (C drive) where recovery CD is set is clicked.

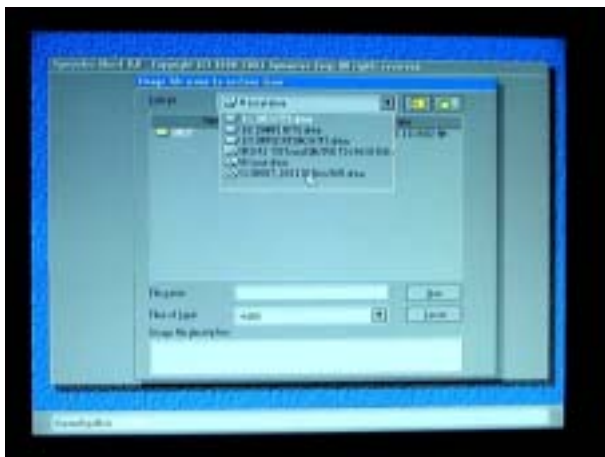


Fig. 33 Display of Drive select

17. CDR00001.GHO is clicked.

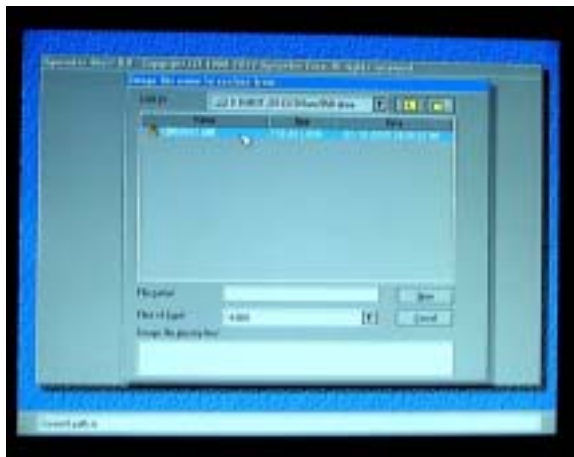


Fig. 34 Display of CDR00001.GHO select

18. If the screen below is displayed, OK is clicked.

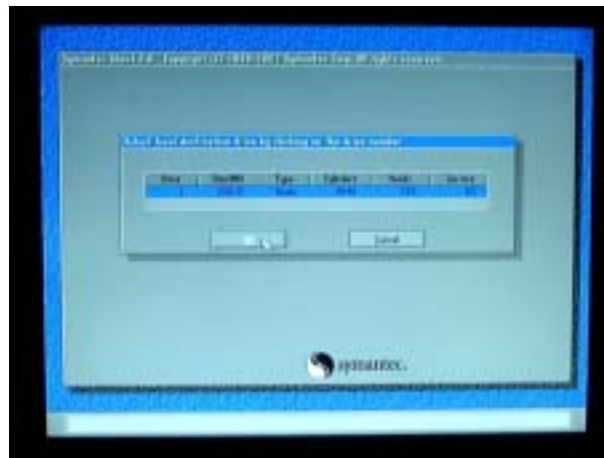


Fig. 35 Display of select local destination drive

19. The size of each partition when restoring it is checked. OK is clicked.



Fig. 36 Display of Destination Drive Details

20. If the screen of Question is displayed, it clicks.

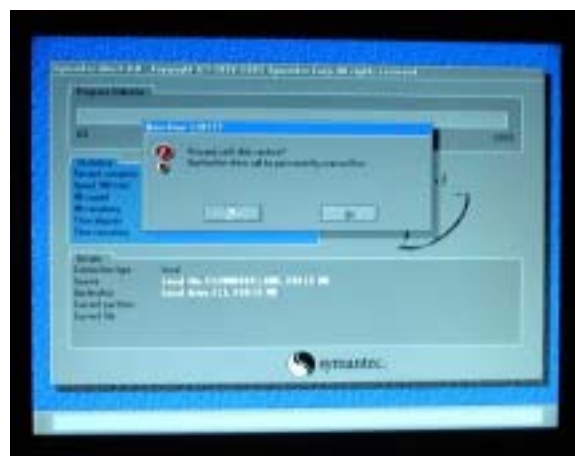


Fig. 37 Display of Question (Restore process started)

21. The restoration begins.



Fig. 38 Beginning of The restoration

22. If the screen below is displayed, CD is replaced.

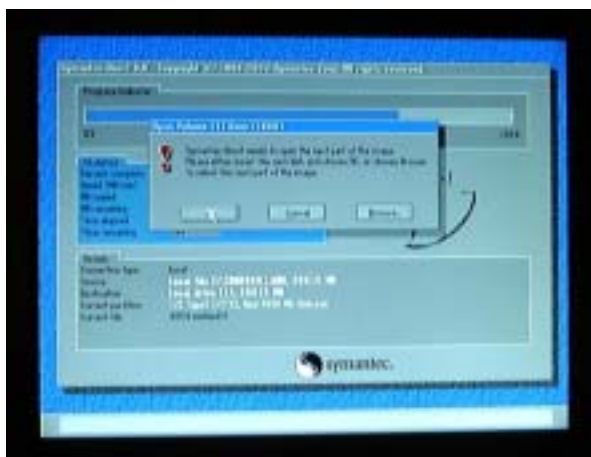


Fig. 39 Display of Swap volume

Recovery CD of the CD drive is replaced by opening the CD drive, and the CD drive is close.

After it is checked that the CD drive close, Yes is clicked.

The restoration is restarted.

Appendix F

F

Operation of High-Voltage Cable

Chapter Contents

- F.1 Spare parts with high-voltage cable
- F.2 Installation procedure of the high-voltage generator side plug
- F.3 Installation procedure of the X-ray tube assembly side mini-plug

F.1 Spare parts with high-voltage cable

Spare parts of the X-ray tube assembly side mini-plug.

Following parts are included in the "Mini-plug spare parts kit "(P/N 511-15061-13).

Silicon Rubber jacket	5pc
Silicon washer	5pc
Silicon Oil	5pc

Spare parts of the high-voltage generator side plug.

Contact pin	P/N 511-15061-11 (Contact pin + tool)
Silicon packing	P/N 532-23029 (3mm thickness)
	P/N 532-23061 (2mm thickness)

Please use silicon packing that the thickness is thin (2mm thickness) when you use the tube voltage meter.



Please exchange the silicon packing, the silicon Rubber jacket and the silicon washer every year. However, please exchange these silicon parts when you remove the cable by the repair, check etc.



Please use only a specified silicone oil for the X-rax tube assembly side. Do not use silicon grease.

***F.2* Installation procedure of the high-voltage generator side plug**

1. Make sure that the MINI receptacle socket assembly is clean.
2. Make sure that termination plug and the mounting accessories are clean.
3. Screw out the Grub Screw and slip the Ring Nut, by making use of its quasi-ellipse hole, over the sleeve.
4. Wet the Silicone Rubber Jacket and Washer with the Silicone Oil.
5. Fit the Silicone Washer over the Contact Pins as shown above.
6. Insert the plug into the receptacle socket till the front-key hits the receptacle bottom. Turn the plug till matches the front-key and further inset the plug.



NOTE

While inseting the plug it is necessary to push the plug aside to let the air escape that os captured in front of the plug.

7. Hand tighten the Ring Nut.
8. Tighten the Grub Screw.

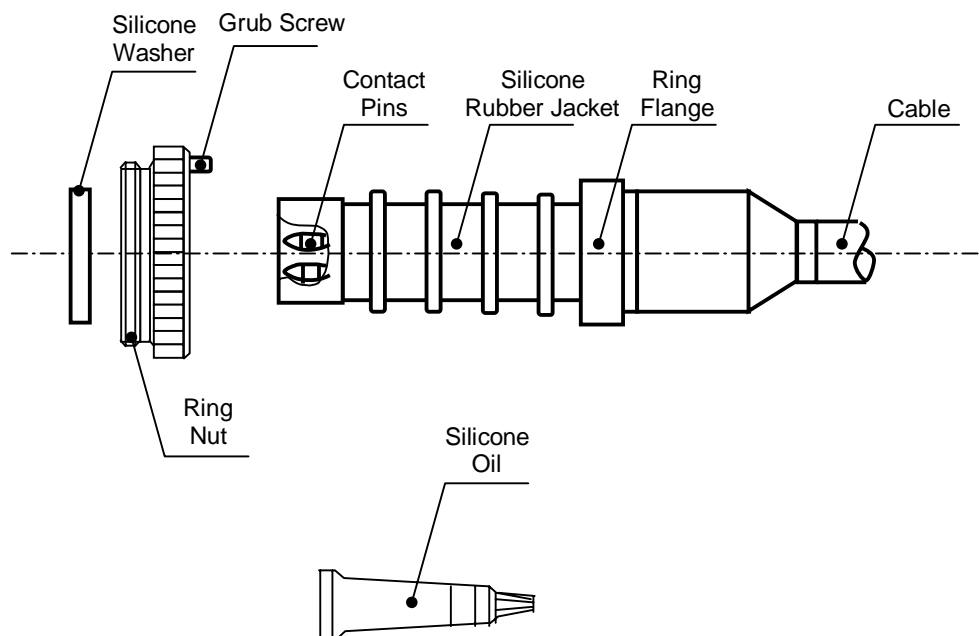


Fig. 1 High-voltage cable (High-voltage generator side)

***F.3* Installation procedure of the X-ray tube assembly side mini-plug**

1. Make sure that the receptacle socket assembly is correctly mounted on generator is clean.
2. Make sure that termination plug and the mounting accessories are clean.
3. Screw out the Grub Screw and slip the Ring Nut over the Sleeve.
4. Place the Divided Flange onto the Ring Flange.
5. Wet the Silicone Washer (both side) and the Rubber Gasket with the Silicon Oil.
6. Fit the Rubber Gasket onto the Plug, against the Ring Flange.
7. Push the Silicone Washer over the Contact Pins.
8. Insert the Termination Plug into the Receptacle Socket (watch the Nipple on the Plug to ensure correct positioning of the Contact Pins)
9. Hand tighten the Ring Nut.
10. Fasten the grub screw to prevent the rotation of the ring nut.

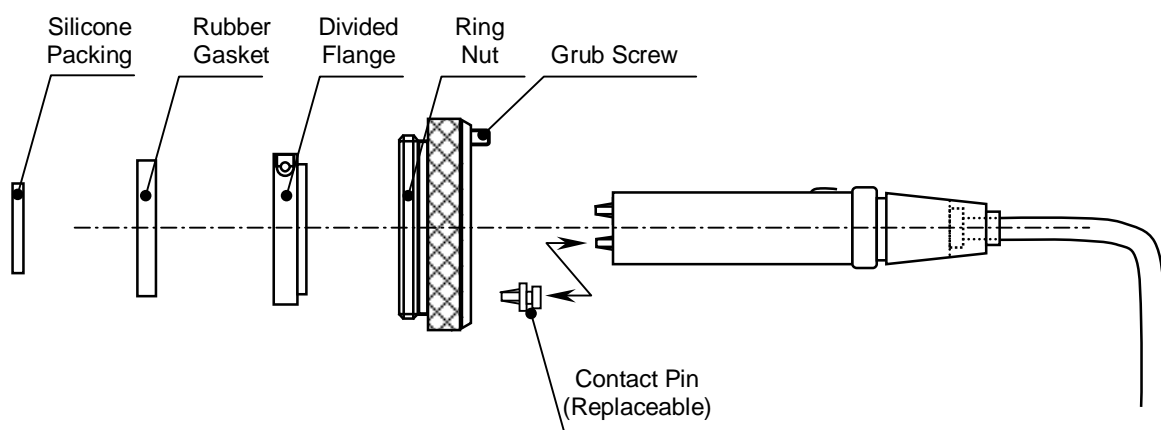
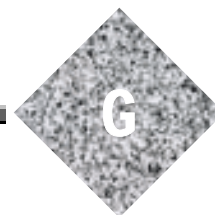


Fig. 2 High-voltage cable (X-ray tube assembly side)

Appendix G



Super-Maintenance Function

Chapter Contents

G.1 Super-Maintenance Function

G.1 Super-Maintenance Function

This unit is provided with a function that can enter the initial setting and adjusting mode (super-maintenance function) without setting DIP switches on NEXSC board.

It is possible to adjust X-ray tube current, to make initial settings, to check the irradiation counter, etc. without opening the covers. With this function X-ray tube current can be easily checked because the unit is automatically brought into the measured value display mode.

Super-maintenance function

1. Initially enter the setting change mode.

2. Press the head key  and collimator lamp key  in

succession within 3 seconds after display



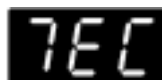
has changed to display



(setting of Power assist control)

3. Display  appears for approx. one second,




and then display





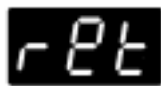

(adjusting mode) appears.



Fig. G-1 Selecting the adjusting mode

4. In this state the display is switched between  (adjusting mode) and  (initial setting) every time kV key is pressed.
5. Press program registration key  with the display of the mode in which the operation is to be executed. Then the unit is brought into the mode that has been chosen.
6. For the operations in each of the modes refer to 4.5 "Initial Settings" in Appendix B "Adjusting modes".

How to finish the mode

7. Pressing the setting change switch  for approx. 3 seconds returns the display to the state of No. 3.
8. If another mode is to be executed, choose the mode in this state.
9. If the operation is to be returned to the normal mode without selecting another mode, press the setting change switch  .
Then display   appears and the normal mode is restored.

No Text